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Vol. 2, pp. 1-71, Pls. 1-11 May 10, 1904

A REVIEW OF CALIFORNIAN POLEMONIACEAE

WITH ELEVEN PLATES

UNIVERSITY

BY

JESSIE MILLIKEN

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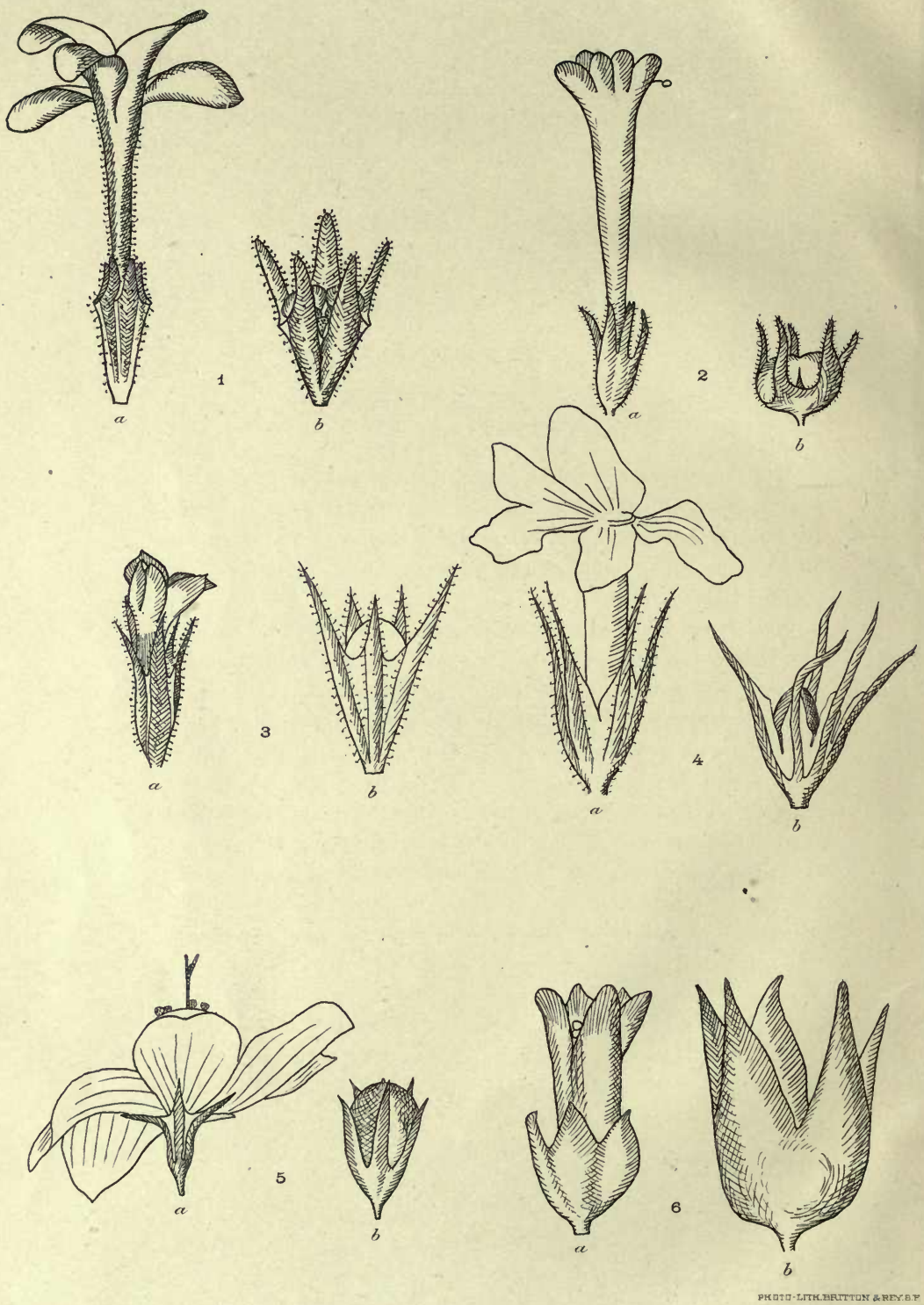

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FLOWER AND FRUIT OF SIX SPECIES.

1. COLLOMIA GRANDIFLORA. 2. GILIA GILIOIDES. 3. NAVARRETIA PUBESCENS.
4. PHLOX AUSTROMONTANA. 5. LINANTHUS LINIFLORUS. 6. POLEMONIUM REPTANS.

a. FLOWER b. FRUIT.

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A REVIEW OF CALIFORNIAN POLEMONIACEAE.*

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BY

JESSIE MILLIKEN.

INTRODUCTION.

The Polemoniaceae, while clearly defined as a natural order of plants, show unusual complexity of variation within the order. By far the greater number of species belong to the western coast of America, hence coming to the observation of botanists only in comparatively recent years.

The order was first defined by Jussieu in 1789, and called by him Polemonia, including the genera Phlox and Polemonium of Linnaeus, and Cantua and Hoitzia of his own. According to Engler and Prantl, Bentham and Hooker, and De Candolle, the genus Hoitzia is synonymous with Loeselia of Linnaeus, and the latter name has remained for six or seven species of Mexican plants. Phlox, Polemonium and Loeselia, with the two Mexican genera, Cobaea and Bonplandia of Cavanilles, have been considered as acceptable from the time of their naming by the early scientists. As this paper treats only of the California Polemoniaceae, the three genera, Loeselia, Cobaea and Bonplandia, which have no representatives within the state are not considered.

In 1798 an expedition was made from Spain to the western coast of South America, and during their visit to Chili and Peru, two Spanish botanists, Hypolito Ruiz and Joseph Pavon, collected many plants, representing, according to their opinion, one hun-

*Thesis presented in partial fulfilment of the requirements for the degree of Master of Science, University of California, December, 1902. Prepared under the direction of Professor W. L. Jepson.

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dred and thirty new genera. Among these were Gilia and Navarretia. It is with the North American representatives of these Chilian and Peruvian plants and their near relatives that the difficulty of classification in Polemoniaceae has been the greatest. Not only have authors differed much as to the best way to define the genera, but they have had to revise their own work many times as more material and further study demanded.

The next important steps in the history of the order were taken in the early part of the nineteeth century, when the western coast of North America became accessable to collectors. Many new genera were described. Among them, Linanthus of Bentham (1833) is the only one deserving generic rank.

To present the complicated synonomy necessary to give a complete history of the genus Gilia. using this term in the most comprehensive sense that it has as yet been used, namely by Asa Gray, in the Supplement to the "Synoptical Flora of North America" would only lead to confusion. Suffice it to say that many of the genera such as Leptodactylon, Fenzlia, Hugelia and Ipomopsis were named by Hooker, Bentham, Michaux and others, from limited material sent to them from the Pacific Coast, but without knowledge of the abundance of related plants still undiscovered, and of the extent of the field. Many of these genera are conveniently used by Bentham in De Candolle's "Prodromus Systematis Naturalis Regni Vegetabilis," IX, (1845), also by Bentham and Hooker, in "Genera Plantarum," II, (1876), and by Engler and Prantl, in "Die Natürlichen Pflanzenfamilien," IV3a, (1897), as subgenera or sections of Gilia. In the last work the Polemoniaceae are worked up by A. Peter.

The most complete and reliable descriptions of North American Polemoniaceae are those of Asa Gray in the "Synoptical Flora of North America," II, the first edition appearing in 1878 and the second in 1886. Since that was published, however, Edward L. Greene has done much work in the way of partial revision. The basis of his division of the order into genera is to be found in "Pittonia," I, (1887), followed by a treatment of Polemonium, Collomia and Navarretia. In "Pittonia," II, (1892), the genus Linanthus is considered. There are two small genera of his own, Langloisia, including three species,

L. Matthewsii, L. Schottii and L. setosissima treated in "Pittonia," III (1898), and Microsteris, within which he groups several species which are considered in this paper and are ordinarily accepted as Gilia gracilis, treated in "Pittonia," III. "The Phloxes of Western North America" (1899), is the title of a paper by Elias Nelson, in which the genus Phlox is revised.

There is need at the present time of a general survey of the order to bring together the results of the latest research, and in attempting this, I have made such omissions, additions and changes as seem necessary from my present point of view. The material studied is that of the Herbarium of the University of California, the Herbarium of the California Academy of Sciences, and also various collections made by Dr. W. L. Jepson, H. M. Hall, H. P. Chandler, J. P. Tracy, M. S. Baker, G. B. Grant, and fresh material obtained during the summer of 1902 and 1903.

The genera of the order, excluding those which have no representative species in California, are six:—Polemonium, L., Collomia, Nutt., Navarretia, R. & P., Gilia, R. & P., Linanthus, Benth., and Phlox, L. Several of the characters formerly relied upon in defining these genera have been found to separate species evidently very nearly related and vice versa. Thus, Gray was led to drop the thoroughly good genus Collomia and merge it in Gilia. His judgment would be justified, since the characters chiefly emphasized proved unreliable, if it had not been possible to find other constant characters to replace them, as is shown below. The mucilagenous seeds, characteristic of Collomia, are possessed by many species in all other respects typical of another genus. Examples of this are Gilia aggregata and Gilia filiformis, Linanthus Bigelovii, and many Navarretia species. The declined stamens, and appendaged filaments of Polemonium are also found outside of that genus. For instance, Linanthus liniflorus possesses hairy appendaged filaments, and the stamens of Gilia Matthewsii are conspicuously declined.

As is stated by Greene, in "Pittonia," I, the form of the corolla, the insertion and direction of the stamens, the character and number of the seeds, are all found to be unreliable as primary generic characters. Greene selects as of first value the calyx.

This is excellent in the case of Collomia and Polemonium, being so reliable that the use of other characters of habit and foliage are almost superfluous.

Taking the order as a whole, Collomia may, in the first place, be well marked off by the turbinate, accrescent calyx, the tube possessing replicate sinuses, and not being distended by the mature capsule. Polemonium is equally distinct with its entirely herbaceous calyx, accrescent, and not distended by the capsule. The other genera cannot be so easily separated by a single character as the foregoing. The pungent, unequally lobed calyx of Navarretia is found to hold with all species agreeing in respect to general habit and foliage. This is true also of Linanthus, but the character of the foliage is necessary to separate some species of this genus from those of Gilia. Still, the cylindrical to urn-shaped calyx, with equal lobes, and conspicuous, broad, hyaline spaces between the ribs, the tube equalling the capsule, but distended, and usually ruptured by the mature fruit, is a primary feature of typical forms. Phlox, to a still greater degree than the last two genera, must be distinguished by the foliage and habit rather than by the calyx, and is the only genus where the form of the corolla is of value. The strictly salver-form corolla with narrow orifice is a constant and, therefore, a reliable character.

After separating the five genera which I have just considered, there still remains a large number of forms, some exceedingly variable and others less so. Looked at superficially, these forms fall into groups which are easily recognized at a glance; but a more careful study shows them to be so intimately related that they must be of one genus. This sixth genus may well take the inclusive name of Gilia, and cover the subgenera corresponding to these unmistakable, but superficial, groups. If connecting links had not been found, these groups would doubtless still be kept as distinct genera, as they were formerly considered.

With the question of genera disposed of, there remains the more difficult task of classifying under each its several species. Leaving considerable latitude for differences of opinion, there are from one hundred and twenty-five to one hundred and seventy-five species on the Pacific side of the Rocky Mountains, and new species are continually being described. It is, therefore, with full

knowledge of the probable incompleteness, and the possibility of wrong judgment that the list of described species with which this paper concludes is offered. The small number of species of Phlox, Collomia, and Polemonium are comparatively well marked and will cause little trouble to the California botanist, except that, among the Polemoniums, there is much confusion in nomenclature concerning P. humile Willd. and P. humile var. pulchellum Gray, P. viscosum Nutt., and P. parvifolium Nutt. The questions can only be settled by access to type specimens which I have not thus far obtained, and the names are used which seem, from a careful reading of the various references to the subject, to come nearest to the truth. The differences between the Navarretia species are not great, but the small differences, referring chiefly to foliage and corolla, are easily recognized except in a few cases of hybrids. The subgenus Eugilia, of the genus Gilia, includes an almost endless variety of forms, which are, with much generalization, reduced to the species named below. More light would doubtless be thrown upon their relationship by a detailed study of geographical distribution and ecologic conditions.

KEY TO THE GENERA.

I. Calyx growing with the fruit, nearly distended by the capsule.

A. Calyx wholly herbaceous. 1. Polemonium.

B. Calyx not wholly herbaceous. 2. Collomia.

II. Calyx growing after the flowering stage, always more or less distended by the capsule, and usually ruptured by it.

A. Stamens equally, or slightly unequally inserted; corolla variable.

a. Calyx lobes unequal and pungent; leaves all alternate. 3. Navarretia.

b. Calyx lobes equal, rarely pungent.

1. Upper leaves alternate, variable. 4. Gilia.

2. Leaves usually all opposite and palmately parted. 5. Linanthus.

B. Stamens very unequally inserted; corolla strictly salverform with narrow orifice. 6. Phlox.

POLEMONIUM, L.

Leaves alternate, pinnatifid; calyx entirely herbaceous, accrescent, and not distended by the mature capsule; filaments more or less declined and hairy at the base.

KEY TO THE SPECIES.

I. Root perennial.

A. Tall, with few branches from a slender tap root.

a. Corolla pink, large. 1. *P. carneum.*

b. Corolla bright blue. 2. *P. coeruleum.*

B. A span high from a more or less tufted root-stock.

a. Leaves scarious, sheathing, pinnae three-parted, crowded. 3. *P. eximium.*

b. Leaves with entire oblong pinnae two to seven lines long; corolla deep blue with yellow tube. 4. *P. pulchellum.*

c. Leaves with entire pinnae one to one and one-half lines long, nearly as broad; corolla pale blue to white. 5. *P. parvifolium.*

II. Root annual.

a. Flowers solitary in the leaf axils, and scattered. 6. *P. micranthum.*

1. Polemonium carneum Gray.

Perennial, a foot or two high, branching and leafy, soft-pubescent; leaves five to six inches long below, an inch or less long in the inflorescence, many broad- to narrow-lanceolate pinnae averaging an inch in length; inflorescence single or in a terminal corymb of two to four flowers; calyx four to five lines long, campanulate, with broad, rounded base, lobes longer than the tube, lanceolate; corolla campanulate, an inch long, pink fading to purple, tube shorter than the corolla, lobes round-obovate; stamens inserted about half way up on the tube, unequal in length, shorter than the corolla, very pubescent at the base; style about equal to the stamens; capsule round, three to four lines in diameter, included in the tube of the enlarged calyx, seeds three to four in each cell.

San Mateo Co., C. T. Blake, J. B. Davy. Near San Francisco, G. R. Vasey. Woods of Siskiyou Co., E. L. Greene.

2. Polemonium coeruleum L.

Perennial, one to three feet high, erect, simple or with few branches, inflorescence glandular-pubescent, otherwise glabrous; leaves four to eight inches long with many lanceolate pinnae about one inch in length; inflorescence of terminal, rather close panicles or small axillary ones; calyx about three lines long, campanulate, the broad, lanceolate lobes shorter than the tube, often with tinges of purple and red; corolla deep blue, campanulate, little more than twice the calyx, tube shorter than the

calyx, lobes obovate, slightly crenate; stamens inserted low in the tube, very pubescent, equalling or exceeding the corolla, declined; style much exserted; "ovules ten in each cell." (Jepson.)

Lake Tahoe, W. C. Blasdale. Western slope of Washoe Mts., Nevada Co., J. B. Davy. Sierra Nevada Mts., H. N. Bolander. Bear Valley, San Bernardino Mts., H. M. Hall. Mendocino Co., Dr. A. Kellogg. Mt. Lassen, Plumas Co., Mrs. C. C. Bruce. Sissons, Shasta Co.

Polemonium coeruleum L. is a European plant and Gray considers the American plant to be the same and calls it P. coeruleum. (Syn. Fl. II, 151). Greene thinks the native plants of the Rocky Mountains and the Sierra Nevada Mountains, and even of the Atlantic states, will be found to be distinct and names them P. occidentale. (Pitt. II, 75.)

3. Polemonium eximium Greene. *P. confertum* Gray.

Perennial, a span high or less; stems few from a tufted root-stock, glandular-pubescent and viscid, "musky fragrant" (Gray); leaves mostly radical, with dilated, sheathing petioles which are scarious, two to four inches long, cauline few and shorter, pinnae many, one to three lines long, three-parted and near together, leaves subtending the inflorescence one-half inch long with few spatulate pinnae entire or with one lobe; inflorescence large for the plant, a close corymb, or headlike, erect; calyx four lines long, funnelform to almost cylindrical, lobes spatulate, covered with quite long glandular hairs; corolla little more than twice the calyx, tube longer than the limb, lobes roundish-obovate, deep blue to purple; stamens inserted half way up the tube, included, slightly pubescent at the base; style with the large three-lobed stigma shorter than the stamens; "ovules about three in each cell" (Gray).

This California species of Greene differs from P. confertum of the Rocky Mountains in having a perfectly erect inflorescence instead of a slightly declined one, and in having shorter corollas.

Mt. Conness, Tuolumne Co., type locality. Mt. Lyall, Mono Co. Harrison's Pass, King's River, Fresno Co. Mt. Dana, Mono Co., F. P. McLean, 12,000 feet, and at Summit 13,050 feet, H. M. Hall and E. B. Babcock. Mt. Goddard,

Fresno Co., H. M. Hall and H. P. Chandler. Head of King's River, C. H. Merriam.

4. Polemonium pulchellum Bunge. *P. humile var. pulchellum* Gray. *P. moschatum* Wormskiold. *P. humile* Lind. *P. pulcherrimum* Hook.

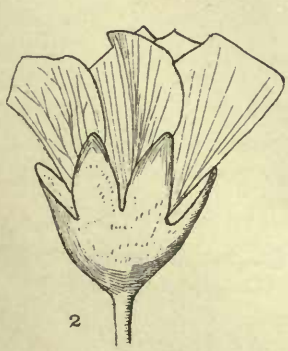
Perennial, about a span high, from a more or less creeping root-stock, few branches, and these principally from the base, conspicuously glandular-pubescent to glabrous; leaves three to six inches long, pinnae five to fifteen, roundish to oblong-oval, two to seven lines long; inflorescence of rather small loose cymes; calyx two and one-half lines long, campanulate, lobes longer than the tube, broad-lanceolate; corolla twice the calyx, pink to blue, with yellow tube which about equals the calyx, lobes obovate, crenate; stamens inserted near the base of the tube but adnate to the top, dilated and pilose at the base, shorter than the corolla, equal, anthers round; pistil conspicuously exserted.

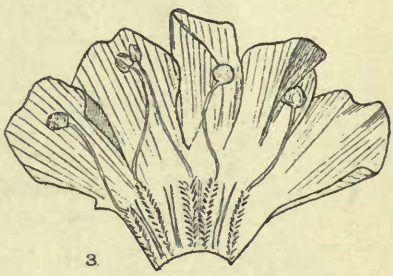
Marble Mt., Siskiyou Co., H. P. Chandler. Plentiful at Donner Pass, Nevada Co., J. B. Davy. Truckee River Basin. Placer Co., Sierra Nevada Mts., A. M. Carpenter. Meadows near Black Mt., Fresno Co., H. P. Chandler and H. M. Hall.

The plant originally described by Bunge is from central Asia and it is quite probable that our plant of the California mountains is not the same, but it seems impossible now to decide.

5. Polemonium parvifolium Nutt. *P. viscosum* (Nutt.) Gray.

Perennial, four to five inches high, from a densely tufted root-stock, with several scaly, short branches bearing closely imbricated leaves at their summits; the flower stems with few and shorter leaves, about twice the length of the basal leaf cluster; the whole plant viscid-pubescent; leaves two to three inches long, leaflets one and one-half lines long or less, nearly as broad, obtuse to broadly acute, at intervals not exceeding their own length; flowers on pedicels not exceeding the corolla, in small groups paniculately arranged; calyx two and one-half lines long, lobes nearly equalling the tube, broad-lanceolate, acutish; corolla twice the calyx, bluish to white; filaments hairy appendaged; style shorter than the lobes.





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POLEMONIUM PARVIFOLIUM.

1. ENTIRE PLANT. 2. FLOWER. 3. COROLLA OPENED. 4. PISTIL.

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In 1897 P. A. Rydberg published in the "Torrey Botanical Club Bulletin," XXIV, 252, a result of his study of P. viscosum Nutt. After seeing the type he says it is much nearer related to P. confertum than to P. humile. P. viscosum as described by Gray in the "Synoptical Flora," on the other hand, is near to P. humile and differs from the original description of P. viscosum by Nuttall, especially in the calyx lobes which are elongated-lanceolate according to Nuttall, and this character is excluded by Gray. A specimen in the California Academy of Sciences from near Lassen's Peak, collected by J. G. Lemmon, No. 26, evidently near P. humile and here described, is probably P. parvifolium Nutt. in manuscript.

6. Polemonium micranthum Benth. *P. antarcticum* Griseb. ex Benth.

Annual, three to eight inches high, many basal branches diverging but finally erect, viscid-pubescent from the base upward; leaves one inch or less long with five to thirteen small lanceolate pinnae; flowers mostly single in the leaf axils and scattered; calyx open campanulate, the broad lanceolate lobes much longer than the tube; corolla "whitish, almost rotate, a line or two long, shorter than the calyx, filaments almost naked at the base" (Gray); capsule round, ovules two or three in each cell.

Plains of Goose Lake, Mrs. R. M. Austin and Mrs. C. C. Bruce.

COLLOMIA Nutt.

Leaves mostly alternate, the lower sometimes paired, never filiform, palmately parted, not strictly pinnate; calyx turbinate, accrescent, and not distended by the mature capsule, scarious below the sinuses, which are are markedly replicate in age; stamens unequally inserted; seeds usually one, or few in each cell.

KEY TO THE SPECIES.

A. Leaves lanceolate, entire or toothed.

a. Corolla large, salmon-yellow. 1. *C. grandiflora.*

b. Corolla small, lobes purple, one line long; calyx lobes subulate. 2. *C. linearis.*

c. Corolla small, purple, lobes one line long; calyx lobes narrow and distinctly awned. 3. *C. tinctoria*

d. Corolla larger than the preceding, five to six lines long, limb three to four lines broad, deep blue; calyx lobes subulate. 4. *C. mazama.*

B. Leaves variously lobed and divided. 5. *C. heterophylla.*

1. Collomia grandiflora Benth.

Annual, from six inches to two and one-half feet high, simple or with few branches, leafy to the top, roughish-puberulent and glandular-viscid to nearly glabrous; leaves alternate, one to two inches long, and one and one-half to three lines wide, usually entire but rarely with short lobes or teeth, tapering at both ends, without petioles, edges often revolute; bracts broader and shorter than the leaves; inflorescence usually of single terminal bracted cluster, with occasionally smaller lateral clusters; calyx two to four lines long, lobes triangular, shorter than the tube, herbaceous; corolla an inch long, funnelform to salverform, orange colored, tube slender, thrice the calyx; stamens inserted somewhat irregularly above the middle of the tube, of unequal length, some included, others exserted; anthers small, round, blue; capsule equalling the calyx tube in length but not distending it, acute at the base, obtuse at the apex, one seed in each cell.

Common in the mountains throughout the state. (Plate 1.)

2. Collomia linearis Nutt. *Gilia linearis* Gray.

Annual, four to twelve inches high, simple or branching, roughish-puberulent; leaves one-half to two inches long, one to four lines wide, entire, tapering at each end, or, above, becoming truly lanceolate, without petioles, edges sometimes revolute; bracts lanceolate, not shorter than the upper leaves; flowers in small terminal clusters, and, on branched specimens, in axillary clusters; calyx three to four lines long, the narrow triangular segments alone herbaceous; corolla only twice the calyx, tube very slender-funnelform, lobes not exceeding 1 line, purple; stamens inserted irregularly and of unequal length in the tube of the corolla; style two lines long, stigmas very short, reaching three-fourths up the tube; one seed in each cell.

San Bernardino Co., H. M. Hall. Fresno Co., H. M. Hall and H. P. Chandler. Truckee, Nevada Co., G. P. Sonne. Deer Park Inn, Placer Co., C. J. Fox, Jr. Bear Valley, Amador

Co., Geo. Hansen. Pine Creek, Lassen Co., M. S. Baker and F. Nutting. Humboldt Co., J. B. Davy.

3. **Collomia tinctoria** Kellogg. *Gilia aristella* Gray.

Annual, three to eight inches high, branching, puberulent, and more or less glandular; leaves alternate, entire, an inch long more or less, not exceeding two lines in width, tapering at both ends, often into a distinct petiole at the base; inflorescence single, or two to three-flowered when axillary, and three to five flowered when terminal, the one to three bracts like the leaves; calyx three lines long, segments narrow at the base and distinctly awned, as long or longer than the tube; corolla six lines long, funnelform, purple, tube very slender, lobes about one line in length; stamens inserted unequally in the upper part of the tube, and of unequal length, anthers minute, blue; pistil exserted; capsule equalling the tube of the calyx, tapering at the base, one seed in each cell.

Humboldt Co., H. P. Chandler. Cañon Creek, Trinity Co., Alice Eastwood. Sisson, Shasta Co., W. A. Setchell and C. C. Dobie. Summit, Sierra Nevada Mts., A. Kellogg, type specimen.

4. **Collomia mazama** Coville.

Perennial, six to twelve inches high, branches few from a slender root-stock; inflorescence glandular, hairy, below glabrous or nearly so; leaves six to fourteen lines long, lanceolate, tapering at the base, sessile or with slightly margined petioles, the upper entire or crenate, the middle and lower with few subulate teeth toward the apex; bracts similar to the upper leaves; flowers congested in a terminal, rather small head-like cyme, occasionally a very small inflorescence from the axil of an upper leaf; calyx three and one-half to four lines long, lobes subulate, blue-margined, equalling the tube; corolla five to six lines long, deep blue, tube narrow, expanding into the ample limb which is three and one-half to four lines broad; stamens nearly equally inserted in the tube, unequal in length, some much exserted and more or less declined; style also much exserted.

Klamath Co., Oregon, Mrs. A. M. Coombs. Near Crater Lake, Oregon, F. V. Coville and J. B. Leiberg. Described here because likely to be found within California.

5. Collomia heterophylla Hook. *Gilia heretophylla* Gray.

Annual, three to fifteen inches high, branching, puberulent, and somewhat glandular; leaves variously divided and cleft in the same plant, most deeply divided at the base; inflorescence of small, bracted, terminal clusters; bracts broad and exceeding the flowers, entire or notched; calyx with only slightly revolute sinuses in the flowering stage but more revolute in fruit, the very slender acerose lobes exceeding the tube in length; corolla four to six lines long, funnelform, tube dark purple, slender, lobes lighter in color, one and one-half lines long; stamens of unequal lengths, inserted unequally in the tube, anthers round, yellow; pistil about half the length of the corolla; capsule oblong, equalling the tube of the calyx, seeds two or three in each cell.

Lower slopes of Mt. Tamalpais, Marin Co., W. L. Jepson, H. P. Chandler. Howell Mt., Napa County, J. P. Tracy. Mendocino Co., W. L. Jepson. Eureka, Humboldt Co., J. P. Tracy. Jackson, Amador Co., Geo. Hansen.

NAVARRETIA Ruiz & Pavon.

Leaves all alternate, pinnatifid, segments setaceous or spinescent; calyx tube scarious between the prominent angles, not splitting in fruit, segments more or less unequal; stamens equally or subequally inserted. There is much more similarity in the habit of the species of this genus than in any of the others.

KEY TO THE SPECIES.

A. All the leaves lax, bracts more or less so.
- *a.* Prostrate, with radiating branches from beneath the sessile primary inflorescence, which is near the ground. 1. *N. prostrata.*
- *b.* A span high; leaves and bracts long and usually twice pinnatifid; primary flower cluster sessile. 2. *N. leucocephala.*
- *c.* Three inches high or less; leaves few, linear, entire or with few segments, bracts more or less rigid. 3. *N. minima.*
- *d.* Four to fourteen inches high; stems leafy to the top; flowers white, small. 4. *N. cotulaefolia.*
- *e.* Equally tall; flowers larger and yellow. 5. *N. nigellaeformis.*
- *f.* Two to six inches high; inflorescence woolly; bracts rigid and pungent; flowers with yellow tube and purple limb. 6. *N. prolifera.*

B. Leaves as well as bracts rigid and pungent.
- *a.* Leaves sometimes lax at the base, rigid above with acerose pinnae; long retrose white hairs on the stem. 7. *N. intertexta.*

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b. Leaves with expanded blade at the apex, this tapering at each end and bearing small sharp teeth. 8. *N. setiloba.*

c. Upper leaves and bracts twice pinnatifid, pinnae very fine and numerous, appearing netted. 9. *N. tagetina.*

d. Soft-pubescent bracts scarious at the broad base, the many teeth spinescent; seeds one in each cell, or a second aborted one. 10. *N. pubescens.*

e. Viscid-pubescent and noxious scented; bracts broad at the base, divisions extending at various angles. 11. *N. squarrosa.*

f. Viscid but sweet-scented, smaller than the preceding. 12. *N. mellita.*

g. Leaves and bracts broad, entire except for few pinnae at the base. 13. *N. heterodoxa.*

h. Stems slender, wiry; leaves linear, entire except one or two pairs of short pinnae at the base. 14. *N. filicaulis.*

i. Less slender than the last; leaves pinnate below and toothed above, capsule four-angled at the apex. 15. *N. mitracarpa.*

j. Bracts with three to five rigid, acerose, divaricate divisions; flowers in many small heads; corolla shorter than the longest calyx lobes, persistent on the mature capsule. 16. *N. divaricata.*

k. Flowers in loose glomerules; flowers short-pedunculate, corolla yellow. 17. *N. Breweri.*

l. Leaves with linear rachis, bracts dilated, with spinose pinnae, double or triple. 18. *N. subuligera.*

m. Viscid-pubescent; leaves with narrow oblong rachis and few pinnae, bracts considerably dilated; flowers deep blue, large. 19. *N. viscidula.*

n. Viscid; leaves very rigid and more or less coriaceous, lobes wholly spinose. 20. *N. atractyloides.*

o. Leaves very broad, not coriaceous, and lobes not wholly white spinose. 21. *N. foliacea.*

p. More slender than the last, three spinose teeth near the apex of the leaves and bracts, strongly recurved or hooked. 22. *N. hamata.*

1. Navarretia prostrata Greene. *Gilia prostrata* Gray. *Navarretia involucrata* R. and P.

Annual, prostrate, with radiating branches making the plant six inches across, glabrous except the inflorescence which is puberulent; leaves and bracts one or two inches long, lax, with narrow strap-shaped rachis, and slender pinnae four or five lines long; primary inflorescence sessile and near the ground, large, radiating branches ending in smaller heads; calyx two lines long, four lobes short and entire, one longer, with one or two teeth, all pungent-tipped; corolla about twice the calyx, slender

tube yellow, lobes purple; stamens inserted at the sinuses equalling or slightly exceeding the lobes, anthers oval, large in proportion to the flower; pistil about equalling the stamens.

Downey, Southern California, A. Davidson. N. involucrata R. and P. is the South American type, and analogue of N. prostrata, according to Greene.

2. Navarretia leucocephala Benth. *Gilia leucocephala* Gray.

Annual, about a span high, simple or branched, glabrous, stems shiny-white; leaves lax, in delicate forms an inch or less long, in more robust forms three and one-half inches, once or twice pinnatifid; inflorescence of terminal heads, the primary one sessile; calyx two to three lines long, slender, lobes acerose, slightly unequal, entire, pungent tips almost awn-like; corolla white, tube very slender, included, limb comparatively broad, lobes nearly two lines long; stamens inserted at or near the sinuses, exserted anthers oblong; pistil much exserted.

Fresno Co. Mariposa Co. Amador Co. Butte Co., Mrs. C. C. Bruce. Lake Co. Solano Co., W. L. Jepson. Mendocino Co.

3. Navarretia minima Nutt. *Gilia minima* Gray.

Annual, three inches high or less, often broader than high, finely puberulent to glabrous; leaves few, linear, entire or with few divisions; bracts as long as the leaves, and exceeding the small heads of flowers, more or less rigid; flowers white, minute; calyx tube five-angled, distinct, cylindrical, with firm distended hyaline spaces, lobes shorter than the tube, spinescent, three of them two to three parted, and longer than the other two.

Monterey Co. Placer Co., A. M. Carpenter. Sierra Valley, northern California. Eagle Lake, Lassen Co., M. S. Baker and F. Nutting.

4. Navarretia cotulaefolia Hook. and Arn. *Aegochloa cotulaefolia* Benth. *Gilia cotulaefolia* Steudel, also Gray excluding *N. pubescens*.

Annual, four to fourteen inches high, simple or branching, quite robust, puberulent; calyx somewhat ciliate; leaves an inch or two long, lax, twice pinnatifid, pinnae many, with short cuspidate tips; outer floral bracts exceeding the inflorescence which

is of terminal and axillary heads; calyx four lines long, with four acerose segments, two long and two short or sometimes five parted; corolla five to six lines long, tube white, about equalling the calyx, lobes four or five, obovate to oblong, capsule frequently only two celled; ovules one or two in each cell.

Lake Co. Solano Co. Alameda Co. Two specimens from Lake Co. more lax and leafy than most forms of Navarretia with leaf-like bracts about the head but with large, wholly yellow, funnelform corollas.

5. Navarretia nigellaeformis Greene.

Annual, in the habit of N. cotulaefolia but the bracts, if not the leaves, more rigid, heads quite large and much bracted, the bracts compound-pinnatifid, the pinnae white-setaceous-tipped; calyx five lines long, slender, tube obscure, two lobes much exceeding the other three and divided; corolla ample funnelform, bright yellow with five dark purple or red spots in the throat, little exceeding the calyx; capsule two celled, two seeds in each cell.

Butte Co., Mrs. C. C. Bruce. Black's, Yolo Co. Merced City. Willows, Colusa Co., J. B. Davy. Porterville, Tulare Co. Mrs. K. Brandegee. San Miguel, Monterey Co., A. Norton. San Luis Obispo Co., M. M. Miles.

6. Navarretia prolifera Greene.

Annual, from two to six inches high, simple or sparsely branched, branches usually starting just beneath the primary inflorescence, almost naked and glabrous; bracts and calyces woolly pubescent, "viscid" (Greene); leaves an inch long or more, filiform, lax, but with setaceous-tipped segments; bracts shorter but with longer segments, rigid and pungent, exceeding the flowers in the small heads; calyx three lines long, with five nearly equal, acerose teeth about equalling the hyaline tube; corolla twice the calyx, tube yellow, expanding into an ample throat, lobes dark purple, one line long; stamens inserted in the upper part of the tube, exserted, but little if at all exceeding the lobes, anthers oval; pistil exceeding the stamens, curving between the lobes; "capsule many seeded" (Greene).

Amador Co., Mrs. K. Curran, and Tulare Co., T. J. Patterson, whence the types.

7. Navarretia intertexta Hook. *Gilia intertexta* Steudel. *Aegochloa intertexta* Benth.

Annual, three inches to one foot in height, simple or branched, usually robust; retrose pubescence on the stem usually dense, white; leaves once or twice pinnatifid, lax at the base, becoming rigid with bristle-like pinnae above, bracts especially rigid with acerose, pungent lobes; inflorescence in terminal heads often quite large, one inch in diameter; calyx three and one-half lines long, with five unequal but entire, stout, very rigid lobes, terminating in white bristles; corolla white, tube exceeding the longest calyx segment, lobes about one to two lines long; stamens and style much exserted, anthers minute, oblong; capsule three-celled and many seeded.

Common through the Sierra Nevada and Coast Range mountains from Shasta Co. to San Diego Co.

8. Navarretia setiloba Coville and Funston.

Annual, six inches or less high, branching, viscid-puberulent throughout, with few gland-tipped hairs above; leaves about one inch long, pinnatifid, the pinnae of the lower half of the leaf simple or toothed acerose lobes, spinescent-tipped, those of the upper half small, with sharp teeth on the expanded blade which tapers at both ends; bracts similar except for the expanded, hyaline base, thus leaving a very narrow central portion, bracts exceeding the calyces; calyx four lines long, lobes subequal, rarely toothed, herbaceous except the setaceous tips, about half the tube which is entirely coriaceous; corolla five to six lines long, tube slender, twice the calyx, limb comparatively large, two and one-half to three lines across, purple; capsule shorter than the calyx tube, round at the base, acute at the apex, one seeded(?).

Between Kernville and Havilah, Kern Co., "Death Valley Expedition," Coville and Funston. Templeton, San Luis Obispo Co., J. B. Davy.

9. Navarretia tagetina Greene.

Annual, three to twelve inches high, simple or with few spreading branches, slightly puberulent; leaves few, one-half to one and one-half inches long, the lower lax, once pinnatifid, the rachis and pinnae linear, the upper twice pinnatifid, the secondary pinnae spinescent, terminal primary pinna with many short, acerose teeth or spines, pinnae of the bracts so many and fine as to give a network appearance characteristic of the inflorescence, which is in a terminal head on the nearly bare branch or, in case of primary ones, several clusters together; calyx three lines long, with very irregular lobes, two larger with at least two pair of pinnae, the three smaller with a single lobe near the apex, hyaline portion inconspicuous; corolla purple (or sometimes white?), one-half inch long or less, tube extremely slender, limb comparatively ample, throat and lobes each a line long; capsule transparent, imperfectly obconical, one-celled, with three compressed seeds.

Howell Mountain, Napa Co., and Vacaville, Solano Co., W. L. Jepson. First collected by E. L. Greene in Siskiyou Co., 1876, then near Folsom, 1883, by Mrs. K. Curran.

10. Navarretia pubescens Hook. and Arn. *Aegochloa pubescens* Benth. *Gilia pubescens* Steudel. *Gilia cotulaefolia* Gray in part.

Annual, five inches to one foot high, simple or branching, pubescent, not viscid, and not strong-scented(?); leaves an inch or two long, flexuous, with many divisions which are usually subdivided, terminal segment often dilated and toothed, cuspidate but scarsely pungent; bracts rigid, scarious at the broad base, the many teeth spinescent; flowers in quite large heads; calyx five lines long, three lobes shorter, entire or with one tooth, two longer and with several teeth; corolla six lines long, funnelform, tube white at the base, becoming purple as it expands upward, lobes very dark purple, one and one-half lines long; stamens inserted at the sinuses, recurved, not equalling the lobes; pistil straight, nearly equalling the lobes; capsule oblong, equalling the tube of the calyx, usually one seed, sometimes two, or one and an aborted second.

Common in hill country Mariposa Co. to Modoc Co., and in Coast Range Mts. in Contra Costa, Solano, and Lake Cos. (Plates 1 and 3.)

11. Navarretia squarrosa Hook and Arn. *Hoitzia squarrosa* Eschscholtz. *Aegochloa pungens* Benth. *Gilia pungens* Hook., Bot. Mag. t. 2977. *Navarretia pungens* Hook., Fl. Bor. Am. ii 75. *Gilia squarrosa* Gray.

Annual, a few inches to two feet high, simple or branched, very viscid-pubescent and noxious-scented; leaves one and one-half inches long or less, twice pinnatifid, pinnae extending in various angles, very rigid and pungent but herbaceous; inflorescence large and round; calyx of five narrow-lanceolate, herbaceous ribs, scarcely united by the hyaline portion, slightly irregular in length, all entire, five lines long; corolla equalling the calyx, funnelform to salverform with quite ample throat; lobes light or dark blue, one and one-half lines long; stamens inserted near the base of the tube, unequal in length and slightly so in insertion, not equalling the tube; pistil also included; capsule oblong, pitted, many seeded.

Common on roadsides and fields from Monterey Co. north to Washington. (Plate 3.)

12. Navarretia mellita Greene. *Gilia mellita* Greene.

Annual, about a span high, branching, often diffusely so, making the plant broader than high, pubescent and "sweet scented" (Greene); leaves one and one-fourth inches long at the base, smaller upward, once or twice pinnatifid, rachis and terminal segment expanded in the upper leaves and bracts, all rigid and pungent; inflorescence of many small heads; calyx two and one-half lines long, lobes five, entire and nearly equal, the hyaline portion firm even in fruit; corolla minute, pale; stamens and pistil included in the tube; capsule oval, coat very thin, many seeded.

Central California, common. Solano Co., W. L. Jepson. Napa Co., E. L. Greene. Marin Co., Mrs. K. Brandegee. Monterey Co., H. P. Chandler.

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NAVARRETIA SQUARROSA.

1. ENTIRE PLANT. 2. COROLLA. 3. COROLLA OPENED.

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13. Navarretia heterodoxa Greene. *Gilia heterodoxa* Greene. *Gilia viscidula* var. *heterodoxa* Gray.

Annual, nearly a foot high and much branched, puberulent, "clammy" (Greene); leaves an inch long or less and quite broad, bracts as broad as long or nearly so, all the foliage pinnatifid at the base and nearly entire upward, the lobes spinescent; flowers in many small heads; calyx two lines long in flower, lobes extremely slender, equal, pungent, the tube split by the mature capsule; corolla five lines long, not conspicuous, lobes narrow, blue, stamens exserted and declined; capsule one line long, oval, very thin walled, fourteen-seeded.

Calistoga, Napa Co., E. L. Greene. Howell Mt., Napa Co., W. L. Jepson. New Almaden, Santa Clara Co., J. B. Davy.

14. Navarretia filicaulis Greene. *Gilia filicaulis* Torr.

Annual, four to eight inches high, branching, stems and branches slender, slightly puberulent but scarcely clammy; leaves an inch or two long near the base, smaller upward, all filiform, entire or with a pair or two of short filiform pinnae at the very base; bracts dilated at the base; flowers in numerous small heads, on leafy peduncles one-half inch long or more, with the long spine-like ends of the bracts exceeding the flowers; calyx one and one-half lines long, teeth unequal in length and breadth, one much exceeding the others in both dimensions, and two very small, all entire; corolla two and one-half lines long, dark purple; stamens and pistil much exserted, nearly twice the corolla, stigmas long; capsule thin walled, one-celled or imperfectly two-celled, with four to eight seeds.

Mariposa Co., J. W. Congdon. Gwin Mine, Calaveras Co., W. L. Jepson. Colfax, Placer Co., E. L. Greene. Forest Ranch, Butte Co., Mrs. C. C. Bruce.

15. Navarretia mitracarpa Greene.

Annual, nearly related to N. filicaulis but not so slender, somewhat glandular-viscid; leaves pinnatifid below and toothed toward the apex; calyx two and one-half lines long, tube rigidly funnelform, lobes longer than the tube, three of them toothed, the other two smaller and entire; corolla four and one-half to six

lines long, funnelform, limb two lines long, lobes and throat about equal, usually with dark spots at the base of the lobes; stamens exserted, declined in age; capsule acute at the base where the dehiscence begins, continuing half way up, the more obtuse apex prominently four angled, one-seeded.

Colusa and Lake Cos., Mrs. K. Curran. Knoxville grade to Lower Lake, Lake Co., W. L. Jepson.

16. Navarretia divaricata Greene. *Gilia divaricata* Torr. in Gray. Proc. Am. Acad. viii, 270.

Annual, two to four inches high, usually branching into a plant as broad as high, branches slender, sparsely puberulent. bracts white-pubescent; leaves few, less than one inch long, entire or with few lax divisions, with very short, white-cuspidate tips; bracts with three to five rigid, acerose, sharp-pointed, divaricate divisions, equalling or exceeding the flowers; inflorescence of many small heads; some heads almost sessile, others on very long leafless peduncles; calyx two and one-half lines long, lobes entire, acerose, almost awned; corolla minute, exceeded by the longer calyx lobes, tubular, one-half line long, light purplish blue, tube persistent about the mature capsule; stamens and pistil included in the tube; capsule not firm when mature, enclosed by the corolla tube, seeds three to six in each cell.

Sierra Nevada Mts. at 6000 to 7000 feet altitude, Modoc Co. to Fresno Co.

17. Navarretia Breweri Greene.

Annual, two to four inches high, branching, stems finely puberulent; leaves with linear rachis and long acerose pungent pinnae, foliage also very finely puberulent; flowers in rather loose glomerules, short pedunculate; calyx three and one-half lines long, lobes straight, entire, twice the tube, slightly unequal; corolla yellow, not exceeding the calyx; stamens longer than the corolla; capsule slightly exceeding the calyx tube, oblong, two seeds in each cell.

Big Valley, Modoc Co., M. S. Baker and F. Nutting. Prosser Creek, near Truckee, Nevada Co., C. F. Sonne.

18. Navarretia subuligera Greene.

Annual, three or four inches high, nearly simple and but slightly puberulent; leaves nearly an inch long with linear rachis, four or five pair of acerose pinnae, the terminal one long, rigid, bracts with broader rachis, sometimes ovate dilated, pinnae spinose, very rigid, usually double, divided to the base, or two- or three-parted; calyx three lines long, two lobes much longer and broader than the other three; corolla tube equalling the calyx, limb small, exserted.

Type, Amador Co., M. R. Curran in the California Academy of Sciences.

19. Navarretia viscidula Benth. *Gilia viscidula* Gray.

Annual, from one to eight inches high, usually branching, pubescent, sometimes viscid; leaves an inch or two long, slender but not lax, becoming broader upward, rachis serrated, or divided into short, setaceous pinnae; bracts considerably dilated in some cases; flowers in medium sized terminal heads; calyx three to three and one-half lines long, segments lanceolate, all setaceous, two of them toothed, the rest entire; corolla twice the calyx, tube exceeding the calyx lobes by one-half line, gradually expanding into quite an ample, yellow throat, lobes broad ovate, two lines long, purple; stamens inserted in the sinuses, about equalling the corolla, anthers purple; pistil equalling the stamens; capsule "normally three to six seeded" (Greene).

Common in the hills of Napa, Solano, Marin Cos., and south to San Diego Co.

20. Navarretia atractyloides Hook. and Arn. *Aegochloa atractyloides* Benth. *Gilia atractyloides* Steud.

Annual, one to eight inches high, the larger forms diffusely branching, puberulent and "viscid heavy scented" (Greene); herbage often purplish; leaves ovate-lanceolate to linear-lanceolate in outline, coriaceous and very rigid, with several long entirely spinose teeth; flowers in small terminal and axillary clusters, hardly capitate; calyx three lines long, lobes five, unequal, entire or toothed, tube obscure; corolla four to five lines long, dark purple, open-funnelform, limb comparatively ample; stamens

inserted in the upper part of the tube, nearly equalling the lobes, anthers oval, blue; stigma included.

Valleys of central and Southern California, and on Santa Catalina Island. "Hybridizing with N. viscidula and N. pubescens in the San Joaquin Valley" (Greene).

21. Navarretia foliacea Greene.

Annual; leaves very broad, foliaceous, not coriaceous but very rigid, pinnae not wholly spinescent but herbaceous at the base; corollas white, small.

Monterey Co. to San Diego Co. Claremont, Los Angeles Co., H. P. Chandler. Clay soil, mesas, San Bernardino Co., S. B. Parish. Witch Creek, San Diego Co., R. D. Alderson.

22. Navarretia hamata Greene.

Annual, four to eight inches high, rather slender and diffusely branching, very rigid, glandular-pubescent, "aromatic" (Greene); leaves mostly with nearly linear rachis and several spinose teeth, the upper three teeth more or less recurved, the terminal one often hooked, bracts broad, foliaceous, and spinescent-lobed; flowers in many small terminal clusters and few smaller axillary ones; calyx segments erect, spinose-tipped, one or two with a few teeth; corolla five to six lines long, salverform, narrow tube considerably exserted, lobes one and one-half lines long, the whole deep purple and proportionately large; stamens and stigma included in the tube; capsule globular, small, not smooth, seeds about twelve, minute, angular.

Monterey Co. to San Diego Co. Monterey Co., H. P. Chandler, No. 378.

GILIA, Ruiz & Pavon.

Leaves mostly alternate, either entire or pinnately lobed, or toothed; calyx split by the mature capsule even when somewhat accrescent, scarious below the sinuses, segments equal; corolla not strictly salverform; stamens equally inserted.

This genus is more variable than the others in general habit and there are exceptions to many of the characters, such as the alternate leaves, the equality of the insertion of the stamens, and,

in G. multicaulis and related species, the calyx grows considerably with the fruit, and may not be split by it. In the subgenus Aegochloa there is irregularity in the corolla.

KEY TO THE SPECIES.

A. Subgenus Microsteria.—Leafy to the top; flowers in pairs or a few in a cluster; corolla tubular-funnelform, not exceeding one-half inch.

a. Leaves all entire, lower opposite; flowers in pairs on unequal pedicels. 1. *G. gracilis.*

b. Leaves all entire; plant not exceeding three inches; flowers two to several in a cluster; calyx densely white-pubescent. 2. *G. depressa.*

c. Leaves alternate, variously lobed and divided; flowers in small clusters, corolla purple, tubular-funnelform. with very small lobes. 3. *G. gilioides.*

d. Leaves alternate, variously lobed and divided; corolla white, salverform to funnelform, limb as broad as long, equalling the tube. 4. *G. Traskiae.*

B. Subgenus Eugilia.—Larger leaves at the base, becoming inconspicuous and bract-like toward the top; flowers single in an open panicle.

a. Base leaves once or twice pinnatifid, with narrow rachis; corolla tube rarely exceeding the calyx, throat and lobes broad and short. 5. *G. latiflora.*

b. Leaves nearly one inch broad, ovate-spatulate with dentate margins. 6. *G. latifolia.*

c. Base leaves usually twice pinnatifid, with narrow rachis, pedicels mostly shorter than the flowers; corolla funnelform, tube slender, attenuated. 7. *G. tenuiflora.*

d. Leaves mostly entire, less than one line wide; corolla dark purple. 8. *G. leptalea.*

e. Leaves all entire, filiform; corolla yellow. 9. *G. filiformis.*

f. Leaves mostly entire, not concentrated at the base; corolla white. 10. *G. capillaris.*

g. Leaves in basal cluster, strap-shaped with few teeth; corolla large, funnelform, dark purple. 11. *G. Davyi.*

h. Leaves in basal cluster, strap-shaped with few teeth; corolla minute. 12. *G. leptomeria.*

i. Leaves in basal cluster, once or twice pinnatifid, corolla about twice the calyx, white to purple. 13. *G. inconspicua.*

j. Even the upper leaves pinnatifid; corolla tube yellow, lobes deep blue. 14. *G. diffusa.*

k. Base leaves once pinnatifid, pinnae obtusish; corolla yellow, tubular-funnelform. 15. *G. ochroleuca.*

C. Subgenus Capitata—Leaves twice or thrice pinnately divided into linear divisions, not concentrated at the base; flowers in more or less dense clusters on naked peduncles.

a. Inflorescence of small loose clusters; calyx mainly herbaceous; corolla tube yellow, throat ample with dark purple markings, lobes pale purple to pinkish. 16. *G. tricolor.*

b. Inflorescence of small loose clusters; calyx mainly herbaceous; corolla with dark spots at the base of the lobes; plant small and glandular. 17. *G. millifoliata.*

c. Inflorescence of terminal and axillary clusters, few-flowered; calyx mainly herbaceous; corolla tubular-funnelform, lobes only one line long. 18. *G. Nevinii.*

d. Inflorescence a panicle, and flowers solitary on long and short peduncles. 19. *G. peduncularis.*

e. Inflorescence of loose head-like clusters; calyx almost entirely herbaceous; corolla less than one-half inch long, dark blue. 20. *G. multicaulis.*

f. Inflorescence of large, rather loose clusters; calyx mainly hyaline; corolla one-half to three-fourths inch long, funnelform with abrupt dilation. 21. *G. abrotanifolia.*

g. Inflorescence of dense heads; calyx as broad as long, chiefly hyaline; corolla bright blue, throat abruptly dilated; stamens much exserted. 22. *G. Chamissonis.*

h. Inflorescence large conglomerate clusters, more or less woolly-pubescent; corolla throat very abruptly dilated, ample, pale, lobes blue; stamens little exserted. 23. *achillaefolia.*

i. Inflorescence small, capitate; corolla light blue to white, throat abruptly dilated but not ample, lobes slender; stamens white, much exserted. 24. *G. staminea.*

j. Inflorescence small, capitate; corolla light blue, slender throughout; stamens equal to or shorter than the lobes. 25. *G. capitata.*

D. Subgenus **Ipomopsis.**—Biennial; inflorescence thyrsoid-paniculate; flowers yellow to red, showy. 26. *G. aggregata.*

E. Subgenus **Elaphocera.**—Biennial or short-lived perennial, woolly; leaves short and pinnatifid, pinnae and rachis broad and lax; flowers capitate-congested. 27. *G. congesta.*

F. Subgenus **Hugelia.**—Erect and rigid, white-woolly at least when young; leaves narrow-linear with few linear divisions; stamens always exserted, anthers sagittate.

a. Root perennial, stems woody; leaves rigid with few very short divisions; inflorescence large. 28. *G. densifolia.*

b. Root annual or biennial; leaves less rigid with few lax divisions; inflorescence small scattered clusters. 29. *G. virgata.*

c. Annual; leaves mostly entire and filiform; flowers solitary or two to three in a cluster, white with narrow dark spots in the throat. 30. *G. sparsiflora.*

d. Annual; corolla sulphur-yellow. 31. *G. lutescens.*

G. Subgenus **Leptodactylon.**—Phlox-like, rigid perennials, with alternate three-parted leaves, more or less fascicled in the axils.

a. Two to five feet high; corolla salverform, more than one inch long with nearly equal breadth of limb. 32. *G. Californica.*

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b. Plant not exceeding two feet; corolla funnelform, not exceeding one inch. 33. *G. pungens.*

H. Subgenus Langloisia.—Rigid low annuals of the desert; leaves pinnately divided, some of the pinnae reduced to bristles; flowers scattered, solitary, without bracts; calyx tube splitting to the base.

a. Leaves with narrow rachis enlarging gradually toward the apex; corolla bilabiate.

1. Corolla only slightly irregular, lobes much shorter than the tube. 34. *G. Schottii.*

2. Corolla very irregular, lobes equalling the tube. 35. *G. Matthewsii.*

b. Leaves abruptly dilated at the apex; corolla regular. 36. *G. setosissima.*

1. Gilia gracilis Hook. *Collomia gracilis* Dougl. *Phlox gracilis* Greene.

A variable annual, an inch to a span high, simple or diffusely branching, entirely covered with fine pubescence and some glandular hairs; leaves all entire, opposite below, becoming alternate above, averaging an inch in length and two to three lines in width; inflorescence mostly two-flowered in the axils, flowers on equal pedicels; calyx three to four lines long, very slender, ribs closely approximated in the flowering stage, slender lobes equalling or exceeding the tube; corolla usually very slightly exceeding the calyx by the tiny spreading limb, tube very slender, equalling the calyx or slightly exceeding it, white or yellow, limb rotate, dark blue or purple; stamens unequally inserted above the center of the tube, filaments very short, anthers narrowly oblong; capsule round to oval, seeds one in each cell.

From San Diego Co. to Modoc Co., both in the Sierra Nevada Mts. and the Coast Ranges.

2. Gilia depressa M. E. Jones.

Annual, one to three inches high, branched, roughish pubescent; leaves few, alternate, linear to narrow-lanceolate, mucronate-tipped, bracts broader lanceolate, but more acute, and cuspidate-tipped; inflorescence with two to several flowers in a cluster; calyx about two lines long, very densely white-pubescent, lobes acerose, very acute, almost awned, recurved, nearly

equalling the tube; corolla white, little exceeding the calyx lobes, oval, short; "stamens inserted above the middle of the tube and slightly exserted" (Gray); capsule oval, shorter than the calyx, "seeds in each cell four to five" (Gray), two in each cell in specimens from Dry Lake near Rabbit Springs, Mojave Desert, collected by S. B. and W. F. Parish.

Argus Mts., Inyo Co., C. A. Purpus.

3. Gilia gilioides Greene. *Collomia gilioides* Benth. *Gilia glutinosa* Gray. *Gilia divaricata* Nutt.

Annual, four inches to two feet high, pubescent, with long white hairs at right angles to the stem, glutinous, usually branching; leaves variable, from a few lines to three inches in length, entire to three-parted, or pinnatifid, with several pairs of pinnae, divisions broad-lanceolate, to narrowly linear; inflorescence single or two- to three-flowered, subsessile and bracted, or on quite long pedicels; calyx about three lines long, slender, lobes acerose, equalling the tube, hairy; corolla tubular, twice or more than twice the calyx, white to purple, lobes very short, not spreading; stamens irregularly inserted in the tube, filaments sometimes equalling the tube, anthers round, blue; stigma blue, included; capsule globular, splitting the calyx, one seed in each cell.

Los Angeles Co., A. Davidson. Modoc Co., M. S. Baker. At intervening stations in the Sierra Nevada and Coast Range Mts. (Plate 1.)

4. Gilia Traskiae Eastwood, MSS.

Annual, a span to a foot high, branching; stems and inflorescence very glandular-viscid, foliage less so; leaves a few lines to three inches in length, variously toothed, lobed or divided, usually pinnatifid, the pinnae with few teeth or lobes, lobes obtusish and mucronate-tipped; flowers solitary or in small clusters, sessile or on pedicels shorter than, or twice the length of the corolla; calyx one to two lines long, open-funnelform to campanulate, broadish, lobes green, longer than the tube which is almost entirely herbaceous; corolla white, salverform to funnelform, narrow tube not longer than the calyx, limb equal-

ling the tube and as broad as long; stamens protruding just beyond the throat, anthers large, blue; capsule globular, slightly exceeding the calyx tube, splitting it.

Nearly related to G. gilioides, differing in the open calyx and salverform corolla with the broad limb equalling the tube. Santa Catalina Island, collected by Mrs. Blanche Trask, May, 1896 and May, 1897, the latter the type. Also collected by T. S. Brandegee on the island, May, 1891.

5. Gilia latiflora Gray. *Gilia tenuiflora var. latiflora* Gray.

Annual, a span to fifteen inches high, branching, nearly glabrous below, glandular above; leaves mostly basal, an inch or two long, once pinnatifid, rachis narrow linear, lobes of about the same width, three to five lines long; upper leaves becoming entire and bract-like; inflorescence a loose panicle, pedicels usually shorter than the flower; calyx one to two lines long in fruit, scarious between the ribs, lobes very short, triangular, sometimes growing to equal the capsule, again much shorter, finally splitting at the sinuses; corolla four to six lines long, tube included, or very little exceeding the calyx, abruptly dilating into the ample throat which is yellow below and purple above, sometimes yellow with purple markings, lobes obovate, purple to white; stamens inserted in the sinuses, filaments very short, anthers round; stigma equalling the lobes of the corolla; capsule short, oval, many seeded.

San Bernardino, San Jacinto, San Antonio and Santa Ana Mts., Southern California. Modoc Co., Mrs. C. C. Bruce. (Plate 4.)

Var. exilis Gray. More slender than the species, many flowers on capillary pedicels an inch or more long; corolla small.

San Jacinto Mt., 5000 feet. Not uncommon through the Southern California mountains.

6. Gilia latifolia S. Watson.

Annual, four to eight inches high, branching but not profusely; glandular-viscid throughout; leaves one to three inches long, sometimes limited to the base of the plant, broadly ovate spatulate, tapering into a short petiole or sessile, margins

dentate, teeth prominent, spinose prolongations of the veins of the blade; inflorescence a loose panicle, with minute setaceous bracts; calyx two and one-half lines long, with rounded base, and cylindrical tube, lobes nearly or quite as long as the tube, setaceous; corolla funnelform, about three lines long, "light pink" (Watson), proper tube one line long, throat one and one-half lines, lobes ovate, acute, one and one-half lines long; stamens inserted at the top of the tube, unequal, anthers oblong, those of the longest filaments slightly exceeding the throat; style included; capsule equalling the calyx, distending it and finally splitting the hyaline tube; seeds many in each cell, black.

In deserts near Keeler, Inyo Co., Coville and Funston. Owens Valley, Inyo Co., G. P. Rixford. Waterman's, Mojave Desert, San Bernardino Co., Mrs. K. Brandegee.

7. Gilia tenuiflora Benth.

Annual, a span to twenty inches tall, slender with simple stem and loosely, paniculately branching inflorescence, glabrous or nearly so below, glandular upward; largest leaves toward the base, one to three inches long, often in a single basal cluster, rachis very narrowly linear, bipinnatifid; inflorescence a loose panicle, pedicels from very short to eight lines long, slender; calyx not exceeding two lines in the flowering stage, white-scarious between the ribs, lobes shorter than the tube, acute, somewhat accrescent but never equalling the mature capsule; corolla four lines to one inch long, slender-funnelform, tube purple in the upper part, very slender, long-exserted, gradually enlarging into the pale yellow throat, lobes ovate with broadly acute apex; filaments inserted just below the sinuses, about half as long as the lobes, anthers round; stigmas equalling the lobes; capsule oblong, two to four lines long with many seeds.

Menifee, Riverside Co., Alice King. Bear Valley, San Bernardino Co., S. B. Parish. Elsewhere in Southern California and as far north as Monterey Co.

Var. altissima Parish. A high altitude variety, very slender, with conspicuous black tack-glands on the pedicels of the inflorescence.

Aliso Cañon and Mt. Gleason Summit, Los Angeles Co., J. H. Barber. San Jacinto Mt., Riverside Co., 5250 feet, H. M. Hall. Foothills near San Bernardino, Parish.

Var. **Purpusii.** Between *G. latiflora* and *G. tenuiflora;* a span high; leaves and lower stem white-woolly, the upper branches and the inflorescence pubescent with black gland-tipped, short hairs; calyx one and one-half lines long, white, hyaline spaces replicate in flower; corolla "pink" (C. A. Purpus), throat appearing yellow, three-fourths inch long, the tube fully six lines long and perfectly cylindrical, abruptly expanding into the very short throat, lobes two lines long, narrow-ovate; stamens and pistil equalling the corolla.

Openings in groves of Pinus Jeffreyi, Mount Hockett Meadows, Tulare Co., C. A. Purpus. Indicated as a species by Miss Eastwood in the Herb. of the California Academy of Sciences.

8. Gilia leptalea Green. *Collomia leptalea* Gray.

Annual, from a few inches to a foot high, nearly glabrous to slightly glandular-pubescent, branching in an effuse panicle; leaves usually entire, an inch long at the base of the stem becoming bract-like upward, very narrow, less than one line wide; flowers solitary on capillary pedicels from two lines to one inch in length; calyx one to two lines long, slender, almost cylindrical, ribs and lobes often blue; corolla dark reddish, at least with reddish purple markings in the throat, from one-third to three-fourths inch in length, slender-funnelform, proper tube equalling the calyx, throat two to three lines long and lobes as long as the throat; stamens unequal, some included, some exserted; style included; capsule ovate, about equalling the calyx, seeds three in each cell.

Sierra Nevada Mts., from Shasta and Lassen Cos. south to Fresno Co. Wawona, Mariposa Co., Alice Eastwood. Yosemite Valley, W. Brown. Lake Tahoe, S. L. Berry. Baker's Camp, Trinity Co., Alice Eastwood. Humboldt Co., Chesnut and Drew. Pine Ridge, Fresno Co., H. M. Hall and H. P. Chandler.

9. Gilia filiformis Parry.

Annual, a span high or less, effusely branched, nearly glabrous, a few glands; leaves all entire and filiform, an inch long or less, the lower opposite, the upper mostly alternate; flowers solitary, scattered, on filiform pedicels varying from one line to one and one-half inches; calyx one to two lines long, open-campanulate in the flower but closing about the capsule, tube almost none, lobes narrowly subulate; corolla twice the calyx, yellow, campanulate, tube short, lobes notched, oblong, truncate; stamens and style very short; capsule oval, equal to the calyx, seeds several (?).

Panamint Mts., Southern California, "Death Valley Expedition," Coville and Funston, 1891.

10. Gilia capillaris Kellogg.

Annual, a span to a foot high, branched, branches typically ascending; glandular and slightly viscid; leaves an inch or less long and one to three lines wide, mostly entire, not concentrated at the base; flowers solitary, pedicels usually not longer than the flowers; calyx one to two lines long, slender in the flower, lobes somewhat recurved; corolla white or white and purple, twice the calyx, tubular-funnelform, lobes a line or less long; stamens included in the tube, anthers round, "blue" (Kellogg); style also included; capsule oval, nearly equalling the calyx lobes, seeds three in each cell.

Red Mt., Mendocino Co., Alice Eastwood. Below Silver Lake, Amador Co., Geo. Hansen. Siskiyou Co., Mrs. K. Brandegee. Modoc Co., Mrs. R. M. Austin. Same place, M. S. Baker and F. Nutting. Placer Co., C. F. Sonne. Same place, A. M. Carpenter.

11. **Gilia Davyi.**

Annual, a span to one foot high, branching from the base or with simple stem and bracteate and branched inflorescence; glandular-pubescent above, glabrous at the base; leaves principally in a basal cluster, an inch or two long, with strap-shaped rachis two to three and one-half lines broad, saliently toothed, teeth broad, cuspidate tipped; flowers scattered, pedicels

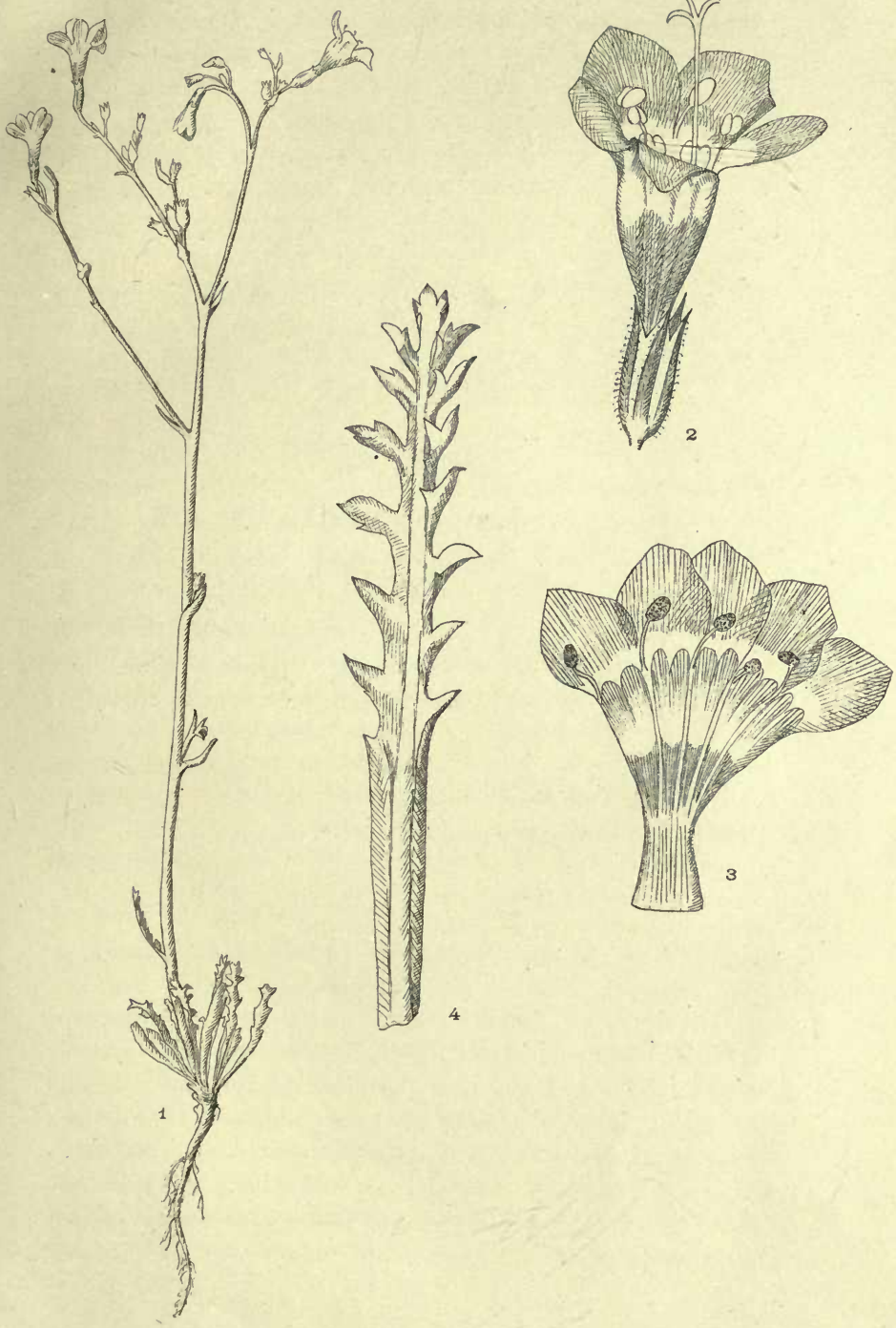

PHOTO-LITH. BRITTON & REY, S.F.

GILIA DAVYI.

1. ENTIRE PLANT. 2. FLOWER. 3. COROLLA OPENED. 4. BASAL LEAF.

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not exceeding one inch, usually not exceeding the calyx; flowers sometimes fragrant, calyx two to three lines long, lobes short, scarious spaces between the ribs conspicuous; calyx becoming larger in fruit, the lobes equalling the capsule, but finally splitting at the sinuses; corolla usually one-half inch long or more, tube cylindrical, yellow at the base and purple at the top, little or much exceeding the calyx, ample throat purple at the base, white at the top with yellow markings, lobes broad, ovate, purple; stamens inserted in the sinuses, about one-half as long as the lobes, anthers round, yellow; stigmas purple, nearly equalling the lobes; capsule three to four lines long, smaller at the apex than at the base, pitted seeds many in each cell.

Antelope Valley, Southern California, J. B. Davy, No. 2178. Winchester, Riverside Co., H. M. Hall. The type specimen is in the Herb. of the University of California, collected by Mr. Davy and named by him to indicate its fragrance which character does not prove to be constant. (Plate 5).

12. Gilia leptomeria Gray.

Coming between G. Davyi and G. inconspicua is this rare California species, with strap-shaped, toothed leaves similar to G. Davyi and very small corollas usually less exserted and with smaller lobes than G. inconspicua.

Kingman, Arizona, N. Wilson. Type locality, mountain valleys of Nevada and Utah. Byrne's Spring, San Bernardino Co., S. B. Parish.

13. Gilia inconspicua Dougl.

Annual, a span to two feet high, branching profusely from the base, or with one straight stem branching into a braeted infloreseence; stems glabrous below, leaves slightly puberulent, stems of the inflorescence minutely glandular; leaves one to two and one-half inches long at the base of the stem, pinnatifid and the pinnae three to eight lines long, usually again pinnatifid or toothed; flowers loosely panieled, pedicels not exceeding one inch, usually much shorter; calyx one to two lines long in the flower, lobes equal to or shorter than the tube, scarious between the ribs, in age very slightly accrescent, usually

only one-half as long as the capsule, finally splitting at the sinuses; corolla three to four lines long, funnelform, from white to purple, with yellow throat, tube included or slightly exserted, lobes roundish with broadly acute apex; stamens inserted almost in the sinuses, filaments very short, anthers round; stigmas equal to or exceeding the lobes; capsule oval to oblong, many seeded.

San Bernardino Co., S. B. and W. F. Parish. Colorado Desert, San Diego Co., W. G. Wright.

Var. **sinuata** Gray. Flowers two or three times as large as those of the species, the tube considerably exserted.

Strawberry Valley, San Jacinto Mts., Riverside Co., H. M. Hall.

14. **Gilia diffusa** Congdon.

From the meager material at hand this species cannot be accurately described. It appears to be nearly related to *G. inconspicua*, but is smaller, more diffusely branching, and even the upper leaves are pinnately divided into linear segments; corolla at least twice the calyx, yellow below and deep blue above.

New Coulterville Road, Mariposa Co., J. W. Congdon. See original description, Erythea, VII, 186.

15. **Gilia ochroleuca** Jones.

Annual, about one span high, branching cymosely above, glabrous except the glandular pubescence on the base of the pedicels; leaves mostly basal, becoming small and bract-like upward, pinnatifid, pinnae obtusish; inflorescence of very loose cymes, pedicels capillary, about six lines long; calyx tubular, one line long, white hyaline spaces conspicuous, lobes minute, subulate; corolla yellow, tubular-funnelform, about twice the calyx (two lines long), lobes with five broad, triangular teeth; stamens and style included; capsule equalling the calyx, splitting it, "seeds developing mucilage and spiricles * * * differing thus from G. mieromeria of Gray, also in the glandular pedicels, and funnelform, tubular, and longer corolla" (Jones).

Growing in sand on Darwin Mesa, Inyo Co. Argus Mts., Inyo Co., at 5000 feet altitude. Erskine Creek, Desert Region of Southern California, C. A. Purpus.

16. Gilia tricolor Benth.

Annual, a span to one foot high, puberulent, simple, or branching; leaves an inch or two long at the base, becoming smaller upward, once or twice pinnatifid, rachis and divisions very slender and lax; inflorescence of small clusters of few flowers or single; calyx two to four lines long in flower, mainly herbaceous, margins of the broad ribs often dark blue or purple, lobes acute, equal to or shorter than the tube, slightly accrescent in fruit, but nearly equalled by the capsule; corolla six to eight lines long, salverform, tube short, included, yellow, throat large, yellow with very dark purple markings, lobes broad ovate, pink to purple; stamens inserted at the sinuses, filaments about one line long, anthers oval; capsule oblong, nearly equalling the calyx, seeds many.

Foothills of the Coast Ranges from Shasta Co. to San Luis Obispo Co. Foothills of the Sierra Nevada Mts. from Shasta Co. to Tulare Co. Mojave Desert, Los Angeles Co., according to A. Davidson. Marysville Buttes, Sutter Co., W. L. Jepson. Elk Grove, Sacramento Co., E. R. Drew.

17. Gilia millefoliata Fisch. and Mey.

Annual, three to eight inches high, simple or with few branches, glandular-viscid; leaves once or twice pinnatifid, with many narrow pinnae; inflorescence one to few-flowered; calyx mainly herbaceous; corolla four to five lines long, funnelform, with dark markings in the throat; running into G. multicaulis.

Humboldt Co., H. P. Chandler, and southward all along the coast to Monterey Co.

18. Gilia Nevinii Gray.

Annual, from two inches to one foot high, simple or branching, glandular-pubescent, often canescent, making the foliage very gray; leaves crowded at the base, typically thrice pinnately divided, the pinnae and rachis very narrow; inflorescence of terminal or axillary clusters of few flowers, on few-bracted

peduncles; calyx two to three lines long, in flower, mainly herbaceous, hyaline spaces very narrow, lobes shorter than the tube, triangular-subulate; corolla tubular-funnelform, bright blue to purple, twice the calyx, lobes only one line long, not spreading; stamens and style included; capsule about equalling the calyx tube, many-seeded.

Islands off the coast of California and Lower California. Guadalupe Island, F. Franceschi, winters of 1892 and 1893.

19. **Gilia peduncularis** Eastwood in herb.

Closely related to G. multicaulis but much more slender and lower, usually much branched, glabrous below; inflorescence a loose panicle, slightly pubescent, flowers solitary on slender pedicels varying from three lines to six inches; calyx lobes slender, subulate, as long as the tube; corolla broad-funnelform, blue with white tube, little exceeding the calyx; stamens included.

Dutard's Ranch and Olano Creek, near the boundary between Santa Barbara and San Luis Obispo Cos. Alice Eastwood, the former the type. Santa Margarita.

20. Gilia multicaulis Benth. *G. achilleaefolia* Lindl.

Annual, four inches to three feet high, branching profusely from the base or simple, puberulent, especially the inflorescence, which is also glandular; leaves once or twice pinnatifid, an inch or two long at the base, cauline leaves sometimes large, usually becoming small and simple, all soft and lax; inflorescence of small terminal clusters, never a compact head, sometimes single-flowered; pedicels usually evident, especially in fruit; calyx two to three and one-half lines long in flower, mainly herbaceous, cylindrical lobes equalling or shorter than the tube, erect, finally growing to exceed the capsule in length but distended and finally splitting at the sinuses; corolla three to seven lines long, twice or thrice the calyx, open-funnelform to salverform, tube included, throat and lobes broad, dark blue or purple; stamens inserted in the throat, equalling or shorter than the lobes; stigmas exserted; capsule oblong, many-seeded.

In the foothills throughout western California. (Plate 4.)

Var. **detonsa** Gray. A depauperate form from dry hills and poor soil, glomerule more loosely three- to five-flowered or only one.

Found small and one-flowered in the Berkeley hills, Alameda Co., in the same square yard with large five-flowered forms. San Luis Obispo Co., Mrs. R. W. Summers.

Var. **eximia.** Annual, six inches to one foot high, pubescence white-woolly on the petioles, close and long on the calyces; calyx three lines long, quite broad, herbaceous ribs projecting beyond the tube in lanceolate acute lobes one line long, spaces between purple to red, hyaline, conspicuous; corolla tube one and one-half lines long, white, throat two lines long, open-funnelform, lobes two lines long, ovate, somewhat acute, they and the throat deep purple.

Evergreen, Santa Clara Co., J. B. Davy, 1883. San Luis Obispo Co., Mrs. R. W. Summers, 1892.

Var. **alba.** Annual, in general habit like delicate forms of G. multicaulis but differing in the following respects: entire plant glabrous; calyx distinctly hyaline between the ribs; corolla pure white throughout, tubular-funnelform, and but slightly exceeding the calyx.

Type, Los Gatos, Santa Clara Co., A. L. Jaggar.

21. Gilia abrotanifolia Nutt., Erythea, iii, 104.

Annual, tall, glabrous, or glandular-pubescent, with few branches or simple; leaves bi- and tri-pinnately dissected; inflorescence large, a rather open cluster, on a long naked peduncle; calyx mainly hyaline, only the ribs and lobes herbaceous, long and narrow; corrolla deep blue, half to three-quarter-inch long and funnelform, not abruptly dilated; lobes oblong; stamens shorter than, or equalling the corolla lobes; style often much exserted; capsule long-oblong.

Claremont, Los Angeles Co., H. P. Chandler. San Luis Obispo Co., Mrs. Blochman. Not uncommon in Southern California.

22. Gilia Chamissonis Greene.

Annual, a span to two feet high, simple or branched, glabrous or puberulent; inflorescence on long naked peduncles in crowded

terminal clusters; leaves large at the base of the stem, two to three and a half inches long, bi- or tri-pinnatifid, rachis and divisions all slender, linear; calyx one and a half to two lines long, nearly as broad in the middle, the tips short-pointed, connivent before and after flowering, tube mainly hyaline, ribs often blue or purple instead of green; corolla deep blue throughout, twice or thrice the calyx, throat broad, abruptly dilating from the cylindrical tube, but not as conspicuously so as in G. achilleaefolia; stamens inserted in the sinuses, much exserted, anthers yellow; stigmas short but much exserted.

San Francisco Bay region, and south to Monterey Co. on the sandy coasts. Above Copperopolis, Calaveras Co., J. B. Davy approaching G. staminea.

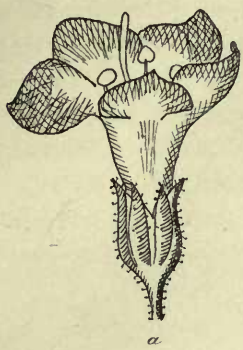
23. Gilia achilleaefolia Benth.

Annual, a span to two feet high, branching or simple, glabrous or nearly so, except the inflorescence which is more or less densely white-woolly; leaves two or three inches long at the base of the stem, bipinnatifid, upper leaves smaller and once pinnatifid; inflorescence terminal on long naked peduncles, a dense cymose cluster, not strictly a head, often elongated; calyx two to three lines long, mainly hyaline, lobes short-triangular, very acute, not accrescent in fruit; corolla with a cylindrical tube one to two lines long, white, throat very abruptly dilated, short and broad, lobes broad and spreading, blue; stamens inserted at the sinuses but slightly exserted, anthers yellow; stigmas long and exserted; capsule round or oval, several-seeded.

San Diego Co. to San Joaquin Co. in the foothills, not on the sandy coast. This is G. achilleaefolia Benth. according to J. D. Hooker, "Botanical Magazine," t. 5939; not G. achillcaefolia Benth. according to W. J. Hooker, "Botanical Magazine," t. 3440 which is Gray's G. multicaulis, also Greene's. (Plate 4.)

24. Gilia staminea Greene.

Annual, a foot or so tall, rather slender, not at all glandular, but the arachnoid pubescence sparse on the petioles and dense on the calyces, otherwise glabrous; inflorescence capitate congested; calyx small, mainly hyaline; corolla pale blue, throat



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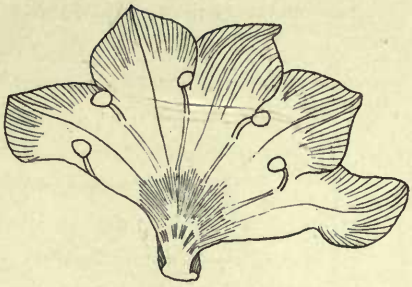

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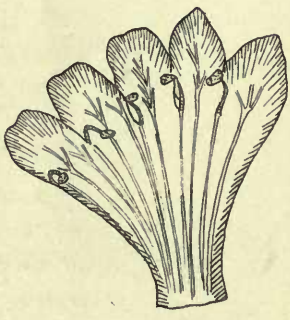

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1. GILIA LATIFLORA.

a. ENTIRE FLOWER.

b. COROLLA OPENED.

2. GILIA ACHILLEAEFOLIA.

a. ENTIRE FLOWER.

b. COROLLA OPENED.

3 GILIA MULTICAULIS.

a. INFLORESCENCE.

b. ENTIRE FLOWER.

c. COROLLA OPENED.

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abruptly dilated but not ample as in G. achilleaefolia and lobes nearly as narrow as in G. capitata; stamens much exserted, anthers nearly white; style also exserted.

Nashville, El Dorado Co., G. P. Rixford. Common in the interior, from Mariposa Co. to Shasta Co.

In Muhlenbergia I, No. 3, Heller describes a new species, Gilia pallida, the type found at the Petrified Forest, Sonoma Co. It seems to be nearest G. staminea.

25. Gilia capitata Dougl.

Annual, a span to two feet high, slender, branching, nearly glabrous; leaves once or twice pinnatifid, segments narrow; inflorescence usually in round heads, not large, without woolly pubescence, peduncles long, naked, or with one or two very small bract-like leaves; calyx one and a half to two lines long, slender, hyaline portion between the ribs broad and white, lobes equalling or exceeding the tube; corolla pale blue to white, about twice the calyx, tube nearly equalling the limb, throat not abruptly dilated, lobes narrow, oblong, truncate; stamens pale blue, inserted in the sinuses, exserted slightly beyond the lobes.

Low grounds, Bay of San Francisco to Oregon. Not in the Sierra Nevada Mts.

26. Gilia aggregata Spreng. *Cantua aggregata* Pursh.

Annual, one to two feet tall, erect, usually simple with a long terminal compound raceme, stem leafy, especially at the base; leaves sometimes rosetted; often a woolly pubescence on the stem and leaves; calyx more or less glandular; leaves one to two and one-half inches long, once pinnatifid, rarely divided at the base, pinnae few or many, long, and very abruptly acute; inflorescence of large profuse racemes, pedicels short or none; calyx two to three lines long, two lines broad, tube cup-shaped to funnelform, lobes lanceolate, longer or shorter than the tube; corolla one to two inches long, narrow-funnelform with spreading limb, tube not over three lines broad at the top, lobes half as long as the tube, very slender, acute, or shorter and broader, yellow and bright red, often blotched; stamens of unequal lengths, inserted a little below the sinuses, usually exceeding the tube but not equal to the lobes.

Siskiyou and Modoc Cos. and south in the Sierra Nevada Mts. to Inyo Co.

Var. **Bridgesii** Gray. A small low form with few ascending branches as if from a perennial root; leaves small and lobes obtuse; flowers bright red.

Yosemite, Mariposa Co., Alice Eastwood. Bear Creek, Fresno Co., H. M. Hall and H. P. Chandler.

27. **Gilia congesta** Hook.

Annual, about a span high, branching from the base, branches sometimes so short that it appears matted, more or less woolly-pubescent; leaves three-fourths inch long or less, once or twice pinnately parted, but not at the base, often appearing palmately parted at the apex into three or five divisions, each about the same in width as the rachis; inflorescence crowded in large heads or in smaller heads arranged in a cyme, with long peduncles; calyx one and one-half to two lines long, open-funnelform, mainly hyaline, only the very short acute lobes truly herbaceous, white-woolly; corolla white, three lines long, salverform, tube two lines long and one-half to three-fourths line broad, throat not distinguishable, lobes broad ovate, one line long; stamens inserted at the sinuses, filaments capillary and very short, anthers oval; stigma short, about equalling the stamens; capsule smooth, oval, not equalling the calyx.

Marble Head, Siskiyou Co. Pine Creek, Lassen Co., M. S. Baker and F. Nutting. Modoc Co., M. S. Baker. Shasta Co. and north into Oregon, and south in the higher Sierra Nevada Mts. to Placer Co.

28. **Gilia densifolia** Benth. *Hugelia densifolia* Benth.

Root perennial; plant often woody above the root, usually with many long branches from the base, leafy to the top; leaves rigid, averaging one inch, usually ascending, occasionally recurved with one or more pairs of short rigid acerose divisions; inflorescence of large dense terminal-bracted clusters, slightly floccose-woolly; calyx about three lines long, slender, woolly, two lobes exceeding the other three, all acerose and pungent-tipped, hyaline portion between the ribs very delicate and easily split,

making the tube of uncertain size; corolla eight lines long or more, tubular-funnelform, tube six lines long, slender, pink to pale purple, lobes about two lines long, oblong, deeper in color than the tube; stamens inserted just below the sinuses, not exceeding the lobes, anthers sagittate, linear, a line long; capsule two lines long, angular, tapering slightly at both ends, seeds two to three in each cell, flat, and white-margined.

San Luis Obispo Co. to San Diego Co.

Var. **sanctora.** Corolla fourteen to fifteen lines long and proportionately ample.

Santa Ana River near Riverside, Southern California, H. M. Hall, No. 683.

29. Gilia virgata Steudel. *Hugelia virgata* Benth.

Annual, a span to a foot high, usually branching regularly from every node, the lower branches more often lacking than the upper, the branches rebranched, nearly glabrous except the inflorescence which is more or less floccose-woolly; leaves alternate, narrowly linear, three to fourteen lines long, sometimes entire but usually with one pair of pinnae at the base, long or short but lax, and the whole leaf more often recurved than ascending; flowers sometimes single but usually in small clusters; calyx three and one-half lines long, narrow, lobes of unequal length, extremely slender, and pungent-tipped, tube distended in fruit but not splitting, thus resembling Navarretia; corolla six to seven lines long, funnelform, tube included or slightly exserted, throat ample, yellow, lobes ovate, bright purplish blue beyond the yellow base; stamens inserted at the base of the throat, filaments long, often exceeding the lobes, anthers linear-sagittate, one line long; capsule oblong, tapering at both ends, two seeds in each cell not white-margined.

Mountains throughout the state and plains of Southern California.

Var. **filifolia.** *G. filifolia* Nutt. Small form, flowers very small and slightly exceeding the calyx, lobes often only a line in length.

Lake Co. and Lassen Co.

Var. **floribunda** Gray. Large, dense, floccose heads of large, well exserted flowers.

Corral Hollow, Brewer, and elsewhere in the South Coast Ranges.

Var. **floccosa.** *G. floccosa* Gray. Lower and more profusely branching than the species; corolla not such a bright, clear blue; stamens inserted just below the sinuses or lower, anthers about one-half line long.

A possible species but running in so closely to G. virgata that the characters are not distinct. Found in the mountains with G. virgata and at lower levels, also eastward into Nevada and Arizona.

30. Gilia sparsiflora Eastwood.

Annual, a span to fifteen inches high, slender branches above from the axils of distant alternate leaves, stems very minutely glandular-pubescent, below glabrous; leaves few, averaging one inch in length, with recurved margins, thus appearing filiform, usually entire, occasionally with a pair of short pinnae near the base, these and the main segment cuspidate-tipped, bracts like the leaves but smaller; inflorescence solitary and pediceled when axillary, a cluster of two to three flowers when terminal on the main stem, and subsessile; calyx three to four lines long, densely white-woolly, lobes aristate-subulate, longer than the tube, very slightly unequal; corolla four to five and one-half lines long, funnelform, white with narrow dark spots in the throat, lobes elliptical, about two lines long; stamens protruding through the throat but no more, anthers a line long, narrowly sagittate, white; capsule oblong, nearly equalling the calyx, "seeds few, oblique at the base, three sides generally with rounded angles, developing mucilage and spiricles" (Alice Eastwood).

Collected by Alice Eastwood in King's River Cañon in July, 1899, and also along Bubb's Creek Trail.

31. Gilia lutescens Steud. *Hugelia lutea* Benth.

Annual, four to eight inches high, with few branches in the specimens studied, nearly glabrous below, densely white-woolly in the inflorescence; leaves six to fourteen lines long, narrowly

linear, entire below, usually three-parted near the inflorescence which is congested in small heads at and near the ends of branches; calyx two to three lines long, slender, hyaline, tube very thin, lobes shorter than the tube, ending in delicate white bristles; corolla sulphur-yellow, tube usually included, one and one-half to two and one-half lines long, lobes ovate to oblong; stamens about equalling the corolla or slightly exserted, anthers narrow-linear, nearly one line long.

Mountains north of San Luis Obispo, J. G. Lemmon. Soledad, Monterey Co., Mrs. K. Brandegee. Jolon, Monterey Co., Alice Eastwood.

32. Gilia Californica Benth. *Leptodactylon Californicum* Hook. and Arn.

Shrubby perennial, at times reaching four feet in height, branches, bracts and calyces puberulent; leaves glabrous, palmately parted into three to five divisions, rigid, cuspidate-tipped, two to three lines long, more or less fascicled in the axils, and crowded on the stem, alternate; inflorescence single and borne near the ends of branches and closely massed; calyx four to six lines long, slender, ribs strong, and projecting in pungent acerose lobes about half the tube, hyaline portion well marked as in Linanthus; corolla twelve to fifteen lines long, salverform tube exceeding the calyx, sometimes twice its length, throat very short, lobes large, obovate, the whole pink to purple; stamens inserted on the tube above the middle, filaments short, anthers long-oblong; style almost none, stigmas one and one-half lines long, at the very base of the tube; capsule exceeding the tube of the calyx but not its lobes, rounded at the base, smaller at the apex, walls very firm, cells many-seeded.

In the mountains from San Luis Obispo Co. to San Diego Co. A very viscid form with longer leaves is found near Los Angeles.

33. Gilia pungens Benth. *G. pungens* and *G. Hookeri* Benth. *G. pungens* var. *caespitosa*, and var. *squarrosa* Gray.

Perennial, often matted so as to resemble Phlox Douglasii or taller, with long branches, glandular-viscid, pubescent to nearly glabrous; leaves three-parted to the middle or a little more, three

to eight lines long, erect, or spreading when long, segments linear-acerose, often recurved, pungent, much crowded on the stem or one-half inch apart, but usually obscuring the stem, rarely fascicled in the axils; inflorescence loosely clustered toward the summit of the branches; calyx three to six lines long, very slender, herbaceous ribs extending into acerose, pungent lobes about one-half the length of the tube, hyaline portion between the ribs revolute or distended, resembling Linanthus; corolla nine to fourteen lines long, funnelform, tube sometimes shorter than the calyx but more often considerably exserted, lobes as long as the tube, narrow and truncate, not spreading; stamens equally inserted near the top of the tube, filaments not more than one line long, anthers oblong; style one line long, stigmas the same length; capsule oblong, tapering at both ends, about equalling the tube of the calyx; seeds several.

San Bernardino and San Jacinto Mts., and elsewhere in Southern California at high elevations, from 8500 to 11,500 feet. Sierra Nevada Mts., at similar elevations (Mt. Goddard, above Yosemite, Bear Valley, and northward).

Var. **Hookeri** Gray. Perennial, growing taller than the species, not matted; leaves not more than one-half inch long, the middle division twice the lateral ones, rigid, acerose, especially the lower leaves fascicled in the axils, covered with white pubescence, which is sometimes in tiny tufts, herbage blue-green while that of the species is green; flowers not restricted to the summits of the branches.

Found at lower levels than the species, 6500 to 8300 feet, in the mountains of Southern California. Also in the Sierra Nevada Mts., eastern Oregon and Arizona.

Var. **Hallii**. *Gilia Hallii* Parish. Perennial, flowering branches about one foot long; some of the leaves opposite, becoming alternate at the summit, much fascicled, palmately three-parted, divisions very pungent, acerose, the middle one twice or thrice the lateral ones; flowers less than one inch long, loosely clustered at the summit of the branches or terminating the branchlets half way down the main stem; corolla lobes oblanceolate; stamens nearly sessile.

Type, Coyote Cañon, El Toro Mt., Riverside Co., 5000 feet, H. M. Hall.

Var. **tenuiloba**. *Gilia tenuiloba* Parish. Perennial, flowering branches six inches long; leaves alternate, palmately three-parted, much less rigid than the foregoing variety; flowers solitary and terminal, one inch long or more, light yellow; lobes of the corolla narrow-strap-shaped; anthers on filaments about their own length, one-half line long.

Type, San Jacinto Mt., Riverside Co., S. B. Parish. Seven Oaks, San Bernardino Co., Mr. and Mrs. Grout.

34. Gilia Schottii Watson. *G. setosissima var. exigua* Gray. *Navarretia Schottii* Torr. *Loeselia Schottii* Gray. *Langloisia Schottii* Greene.

Annual, two to six inches high, broader than high, with several depressed branches, roughish-puberulent, stems white, herbage grayish; leaves broad at the apex, gradually tapering to a narrower base, or nearly of the same width throughout, pinnatifid, but the pinnae reduced to long white bristles except for a few small lobes ending in bristles; inflorescence scattered or slightly congested; calyx two to two and one-half lines long, lobes ending in long bristles, exceeding the tube, hyaline portion narrow, splitting in fruit; corolla slightly bilabiate, three and one-half lines long, white, tube two and one-half lines long, one-half line broad, cylindrical, throat almost none, lobes narrow, acute; stamens inserted in the upper part of the tube, hardly exceeding it; capsule strongly three-angled, equalling the calyx exclusive of the bristles, seeds five in each cell, small, not white-margined.

Palm Springs, desert base of San Jacinto Mt., Riverside Co., 500 to 700 feet; and elsewhere in the Colorado Desert region of Southern California.

35. Gilia Matthewsii Gray. *Loeselia Matthewsii* Gray. *Langloisia Matthewsii* Greene.

Annual, an inch to a span high, branched, more or less matted, stems and foliage densely pubescent or nearly glabrous; leaves about one inch long, narrow, pinnately divided, the lower pinnae reduced to long white bristles, the upper ending in bris-

tles, leaves dilated at the apex, but not abruptly so; inflorescence scattered or slightly congested; calyx two to two and one-half lines long; corolla tube two and one-half to three lines long, one-half line wide, cylindrical, throat small, limb strongly bilabiate, lobes narrow, dentate, purple, or white, streaked with purple or red; stamens strongly incurved, much exserted; seeds eleven to twelve.

Near Dry Lake, Rosamond, Kern Co., J. B. Davy. Smith Mt., Riverside Co., H. M. Hall. Distributed as G. Schottii from Inyo Co. by Dr. Matthews, 1871; Mohave Desert by Palmer, Lemmon, Parish, Pringle. Near Newhall by Nevin.

36. Gilia setosissima Gray. *Navarretia setosissima* Torr. and Gray. *Navarretia Schottii* Torr. *Gilia Schottii* Watson. *Langloisia setosissima* Greene.

Annual, an inch or two high, branching into a mat, slightly roughish-puberulent; leaves one-half inch long, abruptly dilated at the apex which is three-lobed, pinnately divided below, the pinnae reduced to long white bristles usually double; calyx four and one-half lines long, including the bristles; corolla six to nine lines long, white, tube four to six lines long and three-fourths line wide, throat almost none, lobes three to four lines long, oblanceolate, acutish; stamens inserted in the upper part of the tube, reaching half way up the lobes, erect, anthers oblong.

An early and depauperate plant from the deserts of southeastern California, western Arizona and southern Utah, first collected by Coulter.

One specimen from Arizona, N. C. Wilson. It will therefore probably be found in the desert region of Southern California.

LINANTHUS Benth.

Leaves opposite and palmately parted, or rarely entire and linear; calyx with well marked hyaline spaces between the herbaceous ribs, which are prolonged into five equal lobes; flowers solitary or in terminal clusters or heads; stamens equally inserted and usually of equal length; seeds usually many in each cell.

KEY TO THE SPECIES.

A. Dichotomously branched without scabrous pubescence; flowers sessile or subsessile.

a. Not glandular; corolla limb one inch broad. 1. *L. dichotomus.*
b. Not glandular; corolla much smaller. 2. *L. Bigelovii.*
c. Glandular pubescence on calyx. 3. *L. Jonesii.*
d. Soft-pubescent throughout; flowers large with very short tube, and toothed or fringed margins. 4. *L. dianthiflorus.*

B. Less dichotomous; leaves scabrous-pubescent; flowers on capillary or filiform pedicels.

a. Corolla five to six lines long, broad-funnelform to rotate, white, often with blue lines; pilose ring at the base of the filaments. 5. *L. liniflorus.*
b. Corolla three lines long, campanulate, exceeding the calyx by two lines. 6. *L. filipes.*
c. Corolla smaller; calyx extremely narrow with acute base. 7. *L. pusillus.*
d. Corolla minute, not exceeding one and one-half lines, broader than the last; capsule one-seeded. 8. *L. Harknessii.*
e. Corolla tube equalling or slightly exceeding the calyx, limb salverform. 9. *L. Bolanderi.*
f. Corolla one-half inch long, tube equal to the calyx or slightly exserted, expanding into an ample, dark purple throat. 10. *L. ambiguus.*
g. Corolla one-half inch long, tube much exserted. 11. *L. Rattani.*

C. Not dichotomously branched; flowers not on capillary pedicels nor in heads.

a. Corolla one-half to three-fourths inch long, tube very short with a conspicuous appendage at the base of each lobe. 12. *L. Parryae.*
b. Corolla smaller, no appendages. 13. *L. demissus.*
c. Corolla tube six to seven lines long. 14. *L. Pacificus.*
d. Corolla twice the calyx, tube one-half line long, no appendages. 15. *L. concinnus.*
e. Corolla golden yellow. 16. *L. aureus.*

D. Perennials.

a. Flowers in small heads, sessile or subsessile; leaves with broad linear segments. 17. *L. Nuttallii.*
b. Flowers less crowded, pediceled; leaves with narrower segments. 18. *L. floribundus.*

E. Flowers in bracteate heads, sessile, with corolla tube exceeding the the calyx except in L. Lemmoni, L. maculatus and forms of L. densiflorus; herbage ciliate-pubescent.

a. Flowers in small heads; corolla two and one-half lines long, leaves entire. 19. *L. maculatus.*
b. Flowers in numerous small heads; corolla twice the calyx or less, pale yellow with darker throat. 20. *L. Lemmoni.*

c. Flowers in heads; corolla funnelform, with purple to white limb, equalling or exceeding the tube. 21. *L. densiflorus.*

d. Flowers in large heads with broad bracts; corolla tube averaging one inch, throat funnelform, brown or yellow, lobes broad, purple. 22. *L. androsaceus.*

e. Flowers white, tube little exceeding the calyx. 23. *Mariposianus.*

f. Flowers in rather small heads; corolla tube extremely narrow and long-exserted, throat short. 24. *L. parviflorus.*

g. Flowers few in an almost ebracteate cluster; plant gray with close pubescence. 25. *L. Graciosus.*

h. Flower heads small; foliage not at all ciliate but closely spinose-toothed. 26. *L. serrulatus.*

i. Flower with golden-yellow corolla, lobes only one and one-half lines long; leaf segments linear-acerose; plant not exceeding four inches. 27. *L. acicularis.*

j. Corolla tube comparatively broad, lobes barely exceeding one line, limb yellow and reddish-purple; plant one to three inches high. 28. *L. bicolor.*

k. Corolla little exceeding the bracts, or much exserted, lobes one line long or less; bracts long-ciliate-margined. 29. *L. ciliatus.*

l. Corolla large, tube much exserted, lobes obovate or truncate, three to four lines long. 30. *L. montanus.*

m. "Corolla well exserted, lobes rose-red with semilunar vermilion spots near the base" (Greene). 31. *L. neglectus.*

1. Linanthus dichotomus Benth. *Gilia dichotoma* Benth.

Slender large-flowered annual, four to twelve inches high, simple or dichotomously branched, branches at first diverging from the main stem, then becoming erect, the whole plant glabrous except a slight scabrous pubescence on the upper leaves and segments of the calyx, and glandular white pubescence on the inner side of the calyx segments at the sinuses; leaves from one-half to two inches long, averaging one inch, sometimes entire and filiform, usually palmately three-parted, divisions filiform and setaceous-tipped; flowers solitary in the axils or terminal; calyx about one-half inch long with the tube slender and straight or sometimes expanded near the base, thus urn-shaped, scarious except the five ribs, prolonged into linear setaceous segments, more or less recurved; corolla white or purple, with cylindrical tube, slightly exserted in age, abruptly expanding into the short throat, limb about an inch broad, lobes ovate or roughly triangular with a slightly wavy margin; stamens nearly equalling the tube, inserted about one-third from the base of the tube, with pubescent

PHOTO-LITH. BRITTON & REY, S.F.

LINANTHUS DICHOTOMUS.

1. ENTIRE PLANT. 2. FLOWER. 3. BASE OF OPENED COROLLA.

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appendages at the point of insertion; anthers very long and slender, more than one-half the length of the filaments; pistil reaching only one-half way up the tube in the flowering stage, stigma longer than the style; capsule equalling or slightly longer than the calyx tube, long-oval, seeds seven in each cell, small and dark, about one-half line long, covered with a loose white sheath, the whole about one line long.

From San Diego Co. northward at least as far as Napa Co. in the Coast Ranges and eastward into Arizona. Also Marysville Buttes, Sutter Co., W. L. Jepson. (Plate 6.)

2. Linanthus Bigelovii Greene. *Gilia Bigelovii* Gray.

Annual, three to eight inches high, dichotomously branched or simple, glabrous; leaves entire, narrow-linear, one-half to one and one-half inches long; flowers solitary, sessile or subsessile, axillary and terminal, four to six lines long, tube three lines long, almost cylindrical, scarious except the five green ribs which are recurved beyond the tube; corolla little if at all exceeding the calyx teeth.

Colorado Desert, San Diego Co., W. J. Wright. Tucson, Arizona, J. W. Toumey.

3. Linanthus Jonesii Greene. *Gilia Jonesii* Gray.

Annual, four to six inches high, very slender, slightly branched, leaves and branches almost capillary, fine glandular pubescence on the inflorescence; flowers sessile; calyx three and one-half lines long, lobes not exceeding one line; corolla one and one-half times the calyx.

Lagoon Head, Lower California, Edward Palmer, and probably within the California border.

4. Linanthus dianthiflorus Greene. *Fenzlia dianthiflora* Benth. *Gilia dianthiflora* Steud. *G. dianthoides* Endl.

Annual, three to six inches high, usually diffusely branching from the base; stems and herbage slightly white-woolly; leaves one inch long or less, narrowly linear; inflorescence axillary and terminal, single, on pedicels from one-eighth to two inches long; calyx three to eight lines long, lobes merely prolongations

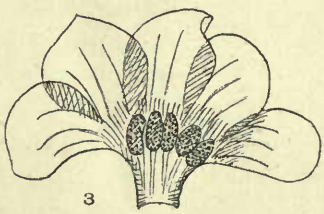
of the narrow ribs, longer than the scarious tube, even thrice its length; corolla broad-funnelform, tube two lines long, dark brown, throat ample, yellow, lobes four to six lines long, broad-obovate, margins fringed, purple, pink or white; stamens inserted at the top of the tube, equalling the throat, anthers small, oblong; capsule three lines long, exceeding the tube of the calyx, bursting it, ovules many, seed-coat pitted.

Common on the western side of the state from San Diego Co. to Santa Barbara Co.

5. **Linanthus liniflorus** Greene. *Gilia liniflora* Benth. *G. pharnaceoides* Benth. *L. pharnaceoides* Greene. *G. liniflorus var. pharnaceoides* Gray.

Slender annual, from three inches to two feet high, usually about one foot, branches dichotomous or alternate, forming a wide angle with the stem, stem and branches filiform, glabrous, or with very few scattered hairs; pubescence of herbage short and scabrous, rarely glandular on the calyx; leaves opposite below, alternate above, lower five to six-parted, divisions about three-fourths inch long, slender and with revolute margins and cuspidate tips, divisions fewer and shorter upwards on the branches, those of branchlets simple and minute; flowers about one-half inch long and as broad as long, scattered, on capillary pedicels varying from a line or two to one and one-fourth inches in length; calyx about two lines long, rarely longer, campanulate, segments about equalling the tube, narrow-lanceolate and cuspidate-tipped; corolla white or purplish, tube about one line long, cylindrical, throat one line long, broadening rapidly, lobes broad-obovate, three to four lines long; stamens inserted below the sinuses, reaching about half way up the lobes, a pilose ring at the base of the filaments; anthers round, sometimes declined; style and stigma slightly exceeding the stamens; stigma one-half line long, three-parted; capsule about one and one-half lines long, tapering at the base; seeds oblong, six in each cell.

Foothills and plains along the coast from San Diego to San Mateo and Santa Clara Cos. Specimens from the central counties much less delicate than southern forms. (Plate 7.)



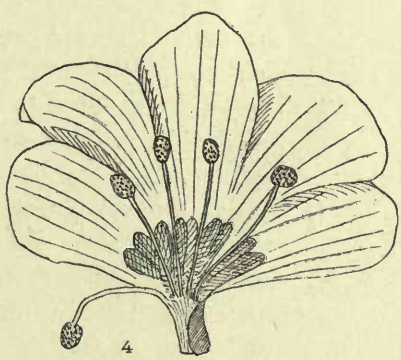


PHOTO-LITH. BRITTON & REY, S.F.

LINANTHUS LINIFLORUS.

1. ENTIRE PLANT. 2. FLOWER. 3. COROLLA OF YOUNG FLOWER OPENED.
4. COROLLA OF OLD FLOWER OPENED.

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6. Linanthus filipes Greene. *Gilia filipes* Benth.

Very slender annual, occasionally simple but usually more or less diffusely and dichotomously branched, branches filiform, diverging, often making the plant broader than high; sparse soft white pubescence on the stem and branches, longer and thicker at the base of the branches, numerous short ascending bristles on the leaves and calyces make those organs very scabrous, especially the leaves; leaves about one-fourth inch long, entire or three- to five-parted, divisions filiform, cuspidate-tipped; flowers small, about one-fourth inch long, numerous, on slender capillary pedicels from one-half to one inch long, terminal and axillary; calyx usually about one line long, extremes one-half line and two lines, campanulate, five segments white-setaceous-tipped, various in length compared with the tube, the latter slightly scarious between the ribs; corolla white and of delicate texture, tube about equalling the calyx tube, narrow-cylindrical, limb about two lines long, campanulate, segments obovate, margins entire or the ends slightly crenate; stamens regularly inserted at the top of the tube, filaments slender, about two-thirds the length of the limb; capsule exceeding the calyx tube, seeds one or two in each cell.

Common on open slopes of the foothills of the Sierra Nevada Mts. and the Coast Ranges, from Shasta Co. south in the Coast Range to Humboldt Co., and south in the Sierra Nevada Mts. to Fresno Co.

7. Linanthus pusillus Greene. *Gilia pusilla* Benth.

Slender branching annual, two to six inches high, branches very slightly divergent to rarely decumbent, stems and branches filiform; pubescence slight on stem and branches, not scabrous, but scabrous on leaves, and absent or sparse and scabrous on the calyx; leaves one-fourth inch long or less, cuspidate-tipped, upper sometimes entire, lower three- to five-parted; flowers very small and numerous on capillary pedicels not exceeding one inch or subsessile; calyx subcylindrical about one and one-half lines long, segments about one-half the tube, erect, setaceous-tipped; corolla about one and one-half lines long, white, or purple, equalling the calyx or slightly exserted, more exserted in age by

the growing capsule, tube shorter than the limb, expanded at the base around the capsule, upper part narrow-cylindrical, lobes narrow-obovate, convolute; stamens inserted near the sinuses, about two-thirds the length of the lobes, sometimes declined; style longer than the filament, stigma short; capsule narrow-cylindrical, about equalling or slightly exceeding the calyx tube, seeds minute, "three to five" (Gray).

San Jacinto, Riverside Co. Witch Creek, San Diego Co. Hullville, Lake Co. St. Helena, Napa Co. Howell Mountain, Napa Co.

Var. **Californicus.** *Gilia pusilla Californica* Gray. Plant larger than the species, sometimes diffusely branching; corolla often twice the calyx.

San Luis Obispo Co., Mrs. R. W. Summers. Elk Grove, Sacramento Co., W. C. Blasdale.

8. Linanthus Harknessii Greene. *Gilia Harknessii* Curran.

Slender annual, from two to ten inches high, averaging six inches; pubescence very slight or lacking on the stems; leaves small at the base, often becoming larger, one-half to three-fourths inch, on the middle of the stem, and first nodes of the branches, three- to five-parted, becoming much smaller and simpler at the ends of the branches, edges revolute, tips mucronate; flowers one or two lines long, on pedicels varying from one-fourth to one and one-fourth inches long; calyx about one line long, campanulate; corolla white, minute, little exserted beyond the calyx, lobes broadly acute; stamens about three-fourths the length of the flower; capsule equalling the calyx tube, oval, seeds one in each cell.

Middle and high Sierra Nevada Mountain regions, from Modoc Co. south to Mariposa Co.

9. Linanthus Bolanderi Greene. *Gilia Bolanderi* Gray.

Slender annual, stems and branches filiform, usually branching dichotomously, about one span high; minute pubescence on the stem and branches, scabrous on the leaves, none on the calyx, or sometimes glandular on the calyx and pedicels and on

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the stems just below the nodes; leaves about one-fourth inch long, segments three to five, cuspidate-tipped; flower pedicels from one-fourth to one and one-fourth inches long; calyx about one-fourth inch long, narrow-cylindrical; corolla all white or with purple-tipped lobes, sometimes with dark reddish-purple spots at the base of the lobes, tube about equalling the calyx, or slightly exceeding it, limb always exserted, salverform in full bloom, lobes broad-obovate with entire edges; stamens inserted just below the sinuses, slightly exserted beyond the throat, anthers round; style long but stigma not exserted beyond the throat; capsule not quite equalling the calyx, teeth broader at the apex than at the base, seeds two to five.

Shasta Co. Humboldt Co. Type from Ukiah, Mendocino Co. Lake Co. Mt. Hamilton, Santa Clara Co., A. Kellogg. Lassen Co. Cloverdale, Mr. Sherlocks. Mariposa Co., J. W. Congdon.

10. **Linanthus ambiguus** Greene. *Gilia ambigua* Rattan.

Annual, four to six inches high, branching with filiform stems, these smooth to the touch, and glabrous to the naked eye, but very minutely and sparsely puberulent; leaves and calyx lobes scabrous-pubescent; leaves five- to seven-parted, two to three and one-half lines long; inflorescence one-to three-flowered from the axils of the upper leaves, flowers on capillary pedicels from one to eight lines long; calyx two and one-half to three lines long, narrow-cylindrical, hyaline spaces very narrow, lobes one line or less long, aristate-subulate; corolla one-half to three-fourths inch long, funnelform, tube one and one-half to two times the calyx, dark purple, throat two lines long, purple below, yellow above, lobes two and one-half lines long, blue-purple, broad-ovate; stamens and style exserted, but only one-half as long as the lobes, anthers oval, yellow; capsule narrow-oblong, included in the tube of the calyx, many seeded.

San Carlos Mt., San Benito Co., Alice Eastwood. Hernandez, San Benito Co. Loma Prieta, Santa Cruz Co., J. B. Davy. On Oak Hill, near San José, Santa Clara Co. Mt. Hamilton, Santa Clara Co., Alice Crane. Livermore, Alameda Co., W. L. Jepson.

11. Linanthus Rattani Greene. *Gilia Rattani* Gray.

Slender annual, two to ten inches high, branching, sometimes dichotomously; leaves from one-eighth to one-half inch long, three- to five-parted, sometimes with a few small glands as well as scabrous pubescence; calyx about two and one-half or three lines long, narrow, nearly cylindrical, lobes only one-half the length of the tube, acute; corolla one-half inch long, white, or the tube pale at the base shading to red-purple at the top, tube much exserted, about equalling the throat and lobes, slender, cylindrical, throat short, purple and cream, lobes slender-oblong, light lavender; stamens inserted just below the sinuses, filaments extremely slender, anthers comparatively large, oval, sometimes declined.

Mariposa Co. Lake Co. Forest Grove, Santa Clara Co., W. L. Jepson.

12. Linanthus Parryae Greene. *Gilia Parryae* Gray.

Annual dwarf plant, one to four inches high, more or less matted; stems and foliage soft-pubescent; leaves crowded at the base, from one-fourth to one-half inch long, five- to seven-parted, sometimes alternate upward; inflorescence somewhat congested, subsessile or short-pediceled; calyx campanulate, tube short, lobes with hyaline portions bordering the ribs, long and spreading, spinulose, constricted over the growing capsule; corolla one-half to three-fourths inch long, purple, yellowish or white, with very short tube, ample expanding throat with five broad scale-like appendages dark in color surrounding the summit, opposite the obovate, spreading lobes, showing through on the outside; stamens inserted at the top of the tube, filaments broad at the base and dark, about equalling the throat, anthers oblong; capsule oblong, seeds small and numerous.

From Kern Co. south. Manzana, Los Angeles Co., J. B. Davy. Mescal Creek, San Antonio Mts., Los Angeles Co., H. M. Hall.

13. Linanthus demissus Greene. *Gilia demissa* Gray.

Annual, an inch or so high, without branches except those forming the inflorescence, soft-pubescent, especially the stems;

leaves less than one-fourth inch long, three- to five-parted, equalling the internodes; inflorescence a terminal cluster nearly as broad as the plant is high; calyx campanulate, the hyaline tube split when in full flower, lobes linear, straight or slightly recurved; corolla five to six lines long, with proper tube one line long, ample throat two and one-half to three lines long, lobes naked and obovate, obtuse; stamens with triangular dilated bases, inserted at the top of the tube, included in the throat, anthers oblong-linear; pistil equalling the throat, stigma segments thread-like.

"Southeastern California" (Greene). None seen except from Arizona.

14. **Linanthus Pacificus.**

Annual, three to eight inches high, diffusely branching, branches alternate or opposite, stems and herbage puberulent, not at all scabrous; leaves three- to five-parted, four to six lines long, setaceous-tipped; flowers single or somewhat clustered; calyx four or five lines long, tube mainly hyaline, two and one-half to three lines long, cylindrical, lobes little spreading if at all; corolla tube six to seven lines long, exceeding the calyx by one line at least, purplish-red, limb open-funnelform, throat about two and one-half lines long, the pinkish lobes three lines, dark-red blotches at the base of the lobes on the throat; stamens inserted at the top of the tube about equalling the throat, anthers oblong; stigmas about equalling the filaments.

Type from Cootca, Palomar, Riverside Co., W. L. Jepson and H. M. Hall.

15. **Linanthus concinnus.** *Gilia modesta* Hall.

Annual, four to six inches high, branching more or less dichotomously, branches making a broad angle with the main stem, stems slightly puberulent, leaves more so, lower pair or two of leaves entire, the rest three- or four-parted nearly to the base, becoming five lines long, divisions slender; flowers single or three to four congested, axillary or terminal, very short pediceled; calyx four to five lines long, tube four lines, mainly hyaline, urn-shaped, pungent-tipped; corolla with tube about

one-half line long, throat one to two and one-half lines, funnelform, lobes three lines long, obovate, tube white, throat yellow, lobes white with two dark lines at the base of each; stamens inserted at the top of the tube, one exceeding the rest but the longest only one-half the throat, anthers oblong.

Type from San Antonio Mts., Southern California, 6000 feet altitude, H. M. Hall. Elysian Park, Los Angeles Co., Mr. and Mrs. Grout.

16. Linanthus aureus Greene. *Gilia aurea* Nutt.

Annual, three to six inches high, diffusely branching, stems filiform, nearly glabrous, foliage scabrous-pubescent; leaves three- to five-parted, divisions about two lines long, rather thick, cuspidate; flowers from one to several from a leaf axil, on pedicels varying from one line to one inch; flowers four to six lines long; calyx three to four lines, herbaceous ribs broad, hyaline portion between narrow, tube narrow-funnelform, lobes somewhat spreading; corolla with tube one line or less long, constricted at the top, throat funnelform, two lines long, a dark reddish band on the lower half of the throat and the upper part of the tube, lobes two to two and one-half lines long, obovate, bright golden-yellow; filaments inserted just below the sinuses, hardly one-half line long, anthers oblong; style filamentous, stigmas equalling the corolla lobes.

Darwin Mesa, Inyo Co. Mojave Desert, San Bernardino Co., and Arizona. Type locality "Santa Barbara" (Acc. to Bot. Death Valley).

17. Linanthus Nuttallii Greene in herb. *Gilia Nuttallii* Gray.

Woody-stemmed perennial, about one span high, profusely branching from the base; foliage and stems puberulent to nearly glabrous; leaves three- to five-parted to the base, lower entire, these and the segments spatulate, lax, acute, curving upward if at all; inflorescence in axillary and terminal clusters; flowers short-pediceled or subsessile; calyx four and one-half lines long, cylindrical, mostly herbaceous, lobes about equalling the tube; narrow-lanceolate; corolla about nine lines long, tube equalling or slightly exceeding the calyx, externally pubescent, throat one

to one and one-half lines long, open, bright yellow, lobes three lines long, narrow-truncate, pale yellow; stamens inserted in the middle of the throat, included, anthers oval, stigmas included; capsule oblong, tapering at the base, seeds two in each cell (?).

Santa Rosa Indian Reservation, El Toro Mt., H. M. Hall. Mountains in San Bernardino Co., S. B. Parish. Kaweah River Basin, R. Hopping. Lake Tahoe, W. C. Blasdale. Eastern Oregon, W. C. Cusick, 7–8000 feet. Cascade Mts., Washington, 5–6000 feet, O. D. Allen.

18. **Linanthus floribundus** Greene in herb. *Gilia floribunda* Gray.

Woody perennial, simple or much branched from the base, very slightly puberulent or glabrous; leaves entire or three-parted, divisions narrow-linear, one-half to three-fourths inch long, recurved or straight, cuspidate, edges revolute; inflorescence of loose clusters or scattered, pedicels slender, sometimes exceeding the flower, others shorter; calyx three lines long, cylindrical, mainly herbaceous, lobes equalling the tube, cuspidate; corolla five lines long, tube one and one-half lines, included, externally pubescent, throat one line long, deep yellow with dark brown at the base, lobes two to three lines long, obovate nearly white; stamens inserted in the middle of the throat, included.

Near the southern border of the state. Coulter, E. W. Morse. Cleveland, Arizona, E. Palmer. San Jacinto, Mrs. Gregory. Elsinore, Riverside Co., A. J. McClatchie. Coyote Cañon, Riverside Co., H. M. Hall.

19. **Linanthus maculatus.** *Gilia maculata* Parish.

Annual, twelve to fifteen lines high, branching quite profusely, somewhat dichotomously, stems and herbage white-pubescent; leaves entire, the upper sometimes alternate, oblong, two and one-half lines long, thickish, spinescent-tipped; flowers mostly crowded into small head-like clusters; calyx two lines long, the green lobes with hyaline margins nearly to the apex, ciliate; corolla white, tube included in the calyx, limb rotate, two lines broad; stamens slightly exserted.

Borders of the Colorado Desert, at Agua Caliente, San Diego Co., W. G. Wright.

20. Linanthus Lemmoni Greene. *Gilia Lemmoni* Gray.

Small annual, from three to six inches high, simple or diffusely branching from the base, upper branches comparatively few in most cases; pubescence soft on the stems, more or less scabrous on the foliage; leaves one-fourth inch or less long, three- to five-parted, divisions linear but not filiform, acute at the tip; inflorescence a single flower or of small heads, both axillary and terminal, on slender pedicels when solitary, subsessile in the head; calyx from one and one-half to three lines long, slenderly cylindrical or somewhat spreading at the top, lobes five, as long as the tube, acute at the tip; corolla three lines long, in large forms nearly five lines, tube bulging at the base, narrowing to expand gradually into the throat, lower part white, upper dark red, throat yellowish, lobes obovate, whitish; stamens inserted just below the sinuses, recurved in age, anthers round; seeds many.

Southern California in San Bernardino, Riverside and San Diego counties. (Plate 8.)

21. **Linanthus densiflorus.** *Leptosiphon densiflorus* Benth. *Linanthus grandiflorus* Greene.

Annual, six inches to two feet high, stout, simple or with one to two short branches near the top, stems glabrous or nearly so, herbage scabrous-pubescent and somewhat ciliate, bracts sometimes densely so at the base; leaves seven-parted, one inch long in larger forms, many of the lower, perhaps half of them drop the segments while the plant is flowering; flowers crowded in a large bracted terminal cluster, showy, subsessile; calyx nearly cylindrical five and one-fourth lines long in large forms, tube four lines long, lobes narrow-lanceolate, acute; corolla one inch long or more, tube not equalling the calyx tube, throat long-narrow-funnelform, yellow, lobes purple, pink or white; stamens inserted a little below the sinuses and little exceeding them, anthers oval.

Mendocino Co., J. B. Davy. Alameda Co., A. Kellogg. Monterey Co., Brewer. San Luis Obispo Co., Blochman. Pos-

PHOTO-LITH. BRITTON & REY, S.F.

LINANTHUS LEMMONI.

1. ENTIRE PLANT. 2. COROLLA. 3. COROLLA OPENED.

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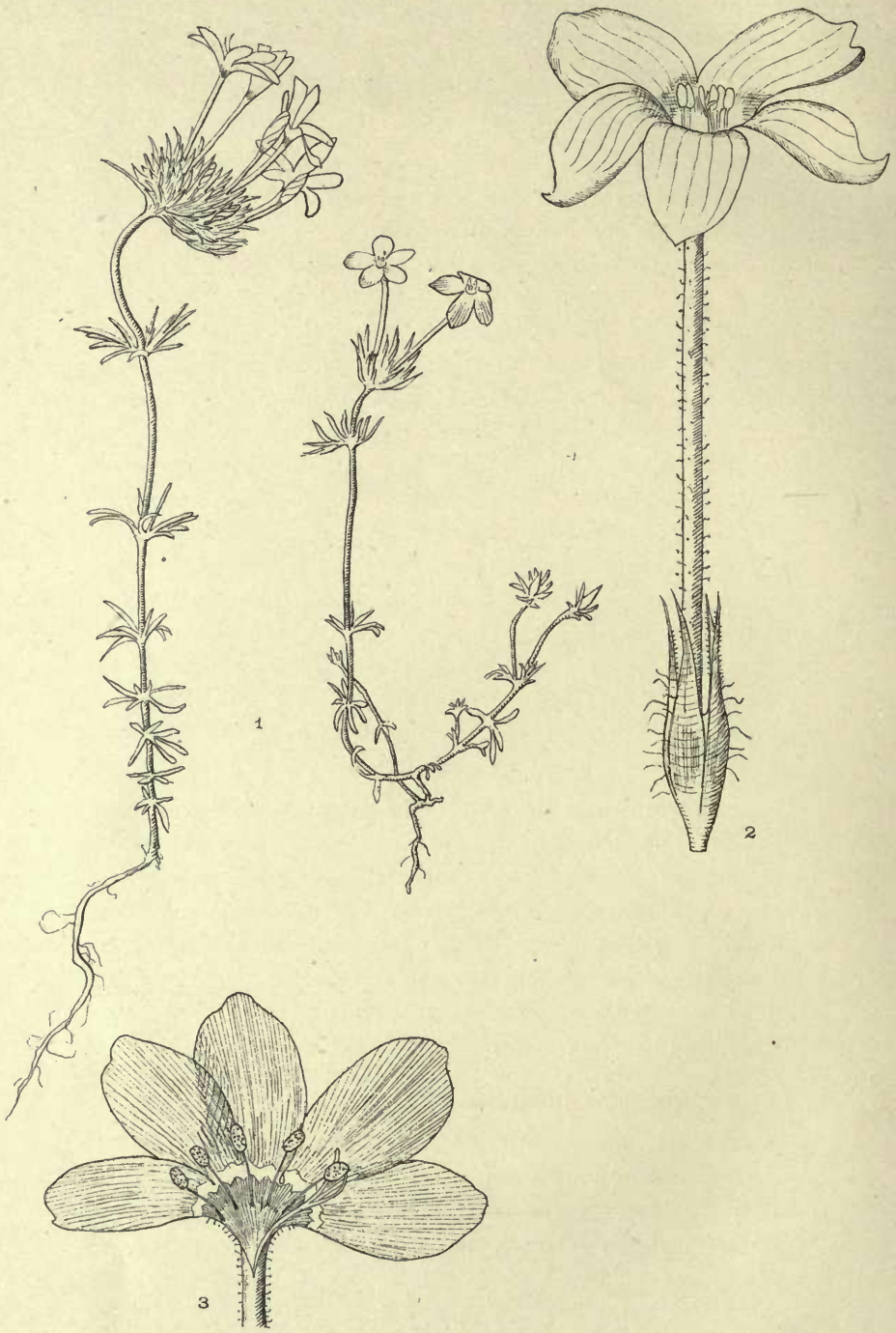

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LINANTHUS ANDROSACEUS.

1. ENTIRE PLANTS. 2. FLOWER. 3. UPPER PORTION OF COROLLA OPENED.

sibly there is a variety with long exserted tube but no specimens are at hand.

22. Linanthus androsaceus Greene. *Leptosiphon androsaceus* Benth. *Gilia androsaceus* Gray.

Rather stout annual, from four inches to one and one-half feet high, usually simple or with few branches, sometimes several from the base, branches widely divergent; minute white pubescence on the stem and corolla tube, and a longer bristly pubescence on the foliage; leaves three- to seven-parted, not always divided clear to the base, the very lowest sometimes entire, segments spatulate except those of the upper leaves which are linear, edges revolute, tips cuspidate; inflorescence of terminal heads, showy; calyx three to four lines long, less than half as broad, five segments equalling the tube, truly herbaceous, the rest more or less scarious; corolla large, tube averaging one inch, narrow-cylindrical, funnelform throat dark brown or yellow, sometimes both, lobes broad-rounded at the apex, from dark purple to nearly white; stamens inserted at the sinuses, anthers oblong, filaments only slightly exceeding the throat; stigma with three slender divisions reaching half way up the lobes of the corolla.

Common on open hillsides. Mendocino Co., W. L. Jepson. Humboldt Co., C. C. Marshall. San Mateo Co., J. B. Davy. Sheep Creek, San Gabriel Mts., H. M. Hall. (Plate 9.)

Var. **breviculus.** *Gilia brevicula* Gray, *Linanthus breviculus* Greene. Smaller than the species, a span or less high, leaves small, narrow, hirsute; heads small, bracts few; corolla tube purple, about twice the length of the bracts, throat with dark markings at the base and yellow above, the same form to the corolla as in the species but the tube longer.

Mohave Desert, S. B. Parish. San Antonio Mountains, Southern California, H. M. Hall. San Bernardino Mts.

23. **Linanthus Mariposianus.**

Slender and sparsely branched annual, a span to one foot high, stems puberulent, leaves and bracts few, hirsute, the three to seven divisions very slender; calyx three lines long, the slender acerose lobes exceeding the tube; corolla one inch long or

less, funnelform, the proper tube white or pale yellow, very slightly exceeding the calyx, limb as long as the tube, throat short, deep purple at the base, yellow above, lobes white or cream, long-oval to oblong; stamens inserted at the top of the dark band in the throat, reaching to the base of the lobes; three capillary divisions of the stigma only exceeding the anthers in maturity.

Type below Mariposa, Mariposa Co., J. W. Congdon, May 10, 1899. Kaweah River Basin, Tulare Co., Ralph Hopping.

24. **Linanthus parviflorus** Greene. *Leptosiphon parviflorus* Benth. *Gilia micrantha* Steud.

Rather slender annual, simple or diffusely branching, principally from the base, usually about a span high or less, occasionally one foot; pubescence short and white on the branches, sometimes almost lacking, longer and hispid on the foliage, slight on the corolla tube; leaves from one-fourth to one-half inch long, three- to five-parted, segments narrow-linear or slightly spatulate; inflorescence of numerous small terminal heads; calyx three or four lines long, narrow, teeth longer than the tube, erect; corolla with a long, very slender tube one to one- and one-fourth inches long, ending abruptly in an expanded yellow throat, lobes narrowly oval, white, cream or yellow, with dark markings outside, limb two to three lines long; stamens inserted in the throat, filaments about one-half the length of the limb, anthers oblong, large for the size of the flower; style usually exceeding the anthers, three long stigma-divisions entirely exserted or divergent, recurved in age, a conspicuous character of the type; capsule equalling the tube of the calyx, narrow at the base, seeds long and narrow.

Common in exposed parts of low hills. Shasta Co., south along the Coast Range hills to San Diego Co.

Var. **luteolus.** *Gilia micrantha* var. *aurea* Benth. *Linanthus luteolus* Greene. Leaf segments linear but not acerose; corolla lobes bright yellow, throat orange, upper tube yellow, lower reddish brown; stigmas less divergent and less exserted than in the species. Often as large flowered as var. rosaceus.

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LINANTHUS PARVIFLORUS VAR. ROSACEUS.

1. ENTIRE PLANT. 2. FLOWER. 3. COROLLA OPENED.

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Warner's Ranch, San Diego Co., H. M. Hall. Palomar, Riverside Co., H. M. Hall. Pacific Grove, Monterey Co., H. P. Chandler.

Var. **rosaceus** Jepson. *Linanthus rosaceus* Greene. *Leptosiphon parviflorus* var. *rosaceus* Hook. Larger than the type of the species, branching from the base; corolla an inch long or more, rose color or white, with yellow throat, tube pubescent but not glandular.

In the region of San Francisco and southward to Monterey Co. (Plate 10.)

Var. **croceus.** Annual, six to eight inches high, much branched, branches ascending, often crooked and confused; branches pubescent with soft white hairs, the base of the inflorescence woolly, revolute margins of the leaves scabrous, with short ciliate pubescence; leaves three- to seven-parted, two to four lines long, lobes spatulate to linear, acute, with very short cuspidate tips, internodes sometimes shorter than the leaves, rarely two inches long, bracts about equalling the upper leaves; inflorescence of roundish heads not exceeding ten lines in diameter; calyx four lines long, tube funnelform, coriaceous, lobes herbaceous but rigid-subulate; corolla two to two and one-fourth inches long, bright yellow, tube very slender, rarely perfectly erect, throat short and very broad, expanding very abruptly from the tube, deeper yellow than the rest, or orange, lobes obovate, fully three lines long; stamens reaching half way up the lobes, anthers oblong, style equalling the filaments, stigmas long, nearly equalling the corolla lobes.

Local, limited to about ten acres near the stage road from Colma to Blenheim, San Mateo Co., Alice Eastwood, May 19, 1901. It is labeled by Miss Eastwood in the California Academy of Sciences as a var. of Gilia androsacea.

25. Linanthus Graciosus.

With the habit of L. parviflorus, very diffuse, a span high, the whole plant grayish with a close pubescence; inflorescence of very many few-flowered clusters or rarely solitary, bracts few; calyx three lines long, subulate, lobes nearly equalling the tube; corolla with a very slender tube an inch long, dark purple or

red, throat very short and broad, yellow, lobes two lines long, ovate, cream colored with a dark purple spot at the base of each; stamens shorter than the lobes; pistil exserted, often much so, stigma with three long divisions.

La Graciosa, Santa Barbara Co., and also San Luis Obispo Co., Alice Eastwood, 1896. The former the type; both specimens in the California Academy of Sciences Herbarium.

26. Linanthus serrulatus Greene.

Annual, four to five inches high, with many diverging ascending branches, stems pubernlent, internodes not much exceeding one inch, leaves and bracts with very narrow, linear, acerose segments, cuspidate-tipped, glabrous except the margins which are not at all white-ciliate, but are closely slender-spinose-toothed; inflorescence of comparatively small clusters, not a compact head as in L. ciliatus and near relatives, therefore the individual calyces are in greater evidence; calyx five lines long, tube one line, this and the lower part of the lobes coriaceous, lobes acerose, subulate, sometimes slightly recurved; corolla about one inch long, tube slender, red, limb two lines long, lobes one and one-half lines, white to lavender; stamens shorter than the lobes, anthers nearly round, stigma about equal to the stamens; capsule oblong, three lines long.

Madera, California, Mr. Buckminster, May, 1889, seen in the California Academy of Sciences Herbarium and probably the type.

27. Linanthus acicularis Greene.

Small annual, two to four inches high, simple or branched; short white pubescence on the stem and corolla tube, hirsute pubescence on the leaves; leaves one-fourth inch long, lower ones shorter, three-parted, segments acerose, stiff; inflorescence of small terminal heads; calyx about two and one-half lines long, narrow, acerose teeth longer than the tube; corolla light yellow throughout or with darker throat, tube very slender, about three times the limb, the whole less than one inch in length; stamens about equalling the lobes, anthers oval; style short, three stigma segments not equalling the stamens.

On sunny hills in western California, not common. Mendocino Co., H. P. Chandler. Calistoga, Napa Co., W. L. Jepson.

Fairfax hills, Marin Co., Alice Eastwood. Same place, C. Michener. Knight's Valley, Sonoma Co., Alice Eastwood.

28. Linanthus bicolor Greene. *Leptosiphon bicolor* Nutt. *Gilia tenella* Benth.

Low annual, from one to six inches high, simple or with few divergent branches, stems more or less pubescent with short bent white hairs, corolla tube slightly pubescent on the outside; leaves scabrous with short hirsute pubescence on the margins, three- to five-parted or the lowest entire and spatulate, segments of the upper leaves narrow, spatulate becoming narrower above, even acerose; inflorescence of small terminal heads; calyx about four lines long, the tube only one line, teeth narrowly lanceolate; corolla from three-fourths to one and one-fourth inches long, tube four times the length of the limb, slender but not extremely so in proportion to the limb, reddish, abruptly expanding into a yellow throat, lobes ovate, rose-purple, one to one and one-half lines long; stamens and stigma about two-thirds the corolla lobes; capsule two to two and one-half lines long, tapering at the base; seeds six in each cell(?).

Humboldt Co., J. P. Tracy. Mendocino Co., W. L. Jepson. Lake Co. Placer Co. Amador Co. Yosemite Valley, Mariposa Co. Fresno Co.

29. Linanthus ciliatus Greene. *Gilia ciliata* Benth.

Annual, from four to fourteen inches high, usually erect and simple, but sometimes with spreading branches principally from the base; stems puberulent, herbage conspicuously margined with long, stiff, white cilia, standing nearly at right angles to the margins, short scabrous bristles also present especially at the apex of the leaves, bracts, and calyx lobes; leaves increasing in size from the base of the plant upward, not exceeding one inch, five to seven linear divisions, cuspidate-tipped; inflorescence of close, rounded, terminal heads, bracts most conspicuously ciliated, concave on the inside, clasping the head with the tips of the divisions finally recurving, this character of clasping bracts being very characteristic of of L. ciliatus and moderately so of L. montanus; calyx one-half inch long, ribs closely approximated

in the flowering stage, hyaline spaces between, expanding with the growth of the capsule; corolla usually little exceeding, occasionally much exceeding the calyx, three-fourths to one inch long, tube slender, cylindrical, minutely puberulent; throat yellowish, short-funnelform, lower part dark purple, upper yellow, lobes one to one and one-half lines long, salverform, purple, pink or white; stamens inserted half way up on the throat, little exceeding it; stigma reaching the point of insertion of the stamens; capsule oblong, many-seeded.

Common through the Sierra Nevada Mts. and the Coast Range Mts. from Modoc and Shasta Cos. south to San Diego Co.

30. Linanthus montanus Greene. *Linanthus ciliatus* var. *montanus* Greene.

Rather stout annual, a foot or less high, usually simple with long internodes; stems slightly pubescent with soft white bent hairs or glabrous; leaf-segment margins scabrous with short hirsute pubescence, bracts with long conspicuous white stiff hairs at right angles to the margins of segments; leaves three- to seven-parted, segments narrowly linear, somewhat revolute, the lower one-fourth inch, the upper one-half inch long; bracts curving about the inflorescence making a rounded head which is terminal; calyx three and one-half to five lines long, quite narrow, the very slender teeth equalling the tube, which is pubescent with long hirsute hairs; corolla about one inch long, tube red, gradually expanding into a yellow throat, lobes two or two and one-half lines long, obovate or truncate, nearly white, sometimes with purple spots at the base; stamens and stigma hardly exceeding the throat.

In Sequoia groves of the Sierra Nevada Mts. Calaveras Co., J. B. Davy. Yosemite Valley, Mariposa Co., W. Brown. Lake Eleanor, Tuolumne Co. Bakersfield, Kern Co. E. M. Day. In habit like large forms of L. ciliatus but differing in the much larger corolla.

31. Linanthus neglectus Greene.

A span high, with few branches, stems puberulent, leaves few, hispid, three-fourths inch long; inflorescence a single flower,

or two to three in a terminal cluster, surpassed by larger clusters on elongated peduncles; calyx and especially the bracts glandular and with some white ciliate hairs; calyx six lines long with a short tube and long acerose lobes with hyaline margins part way up, often recurved; flowers not seen.

Valleys of the Sierra Nevada Mts. in the region of Lake Tahoe and in the State of Nevada. See Greene's description, Erythea, iii. 24.

PHLOX Linn.

Woody-stemmed perennials of high altitudes, leaves opposite, entire; corollas strictly salverform.

KEY TO THE SPECIES.

A. More or less matted; leaves short and crowded.
- *a.* Very densely caespitose and lanate-canescent; leaves subulate. 1. *P. canescens.*
- *b.* Less densely caespitose and less canescent; leaves ovate to lanceolate. 2. *P. Covillei.*
- *c.* Loosely, or somewhat densely tufted, not canescent; leaves acerose; calyx sinuses not replicate. 3. *P. Douglasii.*
- *d.* Loosely tufted; calyx sinuses replicate. 4. *P. austromontana*

B. Not matted; leaves long, not crowded.
- *a.* Branches ascending; leaves broad-lanceolate to ovate. 5. *P. adsurgens.*
- *b.* Branches nearly erect; leaves narrow-lanceolate, not exceeding four lines. 6. *P. dolicantha.*
- *c.* Erect; leaves linear, one to two lines wide. 7. *P. longifolia.*
- *d.* Erect, glandular-viscid above; leaves narrow-oblong, tapering at both ends. 8. *P. occidentale.*
- *e.* Erect, canescent; leaves narrow-lanceolate to linear, margins cartilaginous. 9. *P. Stansburyi.*

1. Phlox canescens Torr. and Gray.

Perennial, growing in very densely appressed mats, lanate-canescent, foliage bluish-gray; leaves but two to three lines long, subulate, pungent; corolla white, "tube yellow" (Torrey), tube twice or thrice the length of the calyx, lanate at the base, lobes broadly obovate, style not half as long as the tube; capsule one-seeded.

Warner Mts., 8000 feet, Mrs. C. C. Bruce. Rocky flat sage-bush land, Modoc Co., M. S. Baker.

2. Phlox Covillei Nelson.

Perennial, caespitose-depressed, grayish with canescent pubescence; leaves ovate to broad-lanceolate, margins cartilaginous, reflexed, central portion thickened with prominent grooves on each side; calyx glandular-pubescent, lobes thick and broad, like the leaves; corolla white, more than twice the calyx.

Black Cañon, White Mts., Mono Co., Coville and Funston. High Sierra Nevada Mts., H. M. Hall (?).

3. Phlox Douglasii Hook.

Loosely or densely tufted perennial, forming mats, leaves crowded on the stems, rigid, acerose, slightly pubescent or glabrous; flowers scattered on short pedicels or subsessile, usually solitary on the annual shoots; calyx without salient angles; corolla tube usually exceeding the the calyx lobes, three to four lines long, obovate, various shades of purple, lilac and white on the same plant.

Common at high altitudes throughout the Sierra Nevada Mts. Trinity Summit, Humboldt Co., W. C. Blasdale. Yosemite Valley, Mariposa Co., W. Brown. San Antonio Mts., Southern California, H. M. Hall.

4. Phlox austromontana Coville.

Near P. Douglasii but less matted, leaves usually less crowded and longer, salient angles to the calyx between the ribs, calyx conspicuously pubescent; two or more flowers on the annual shoots.

Head of Davis Creek, Modoc Co., Mrs. C. C. Bruce. Trinity Summit, Humblodt Co., W. L. Jepson. San Bernardino Mts., S. B. Parish. San Jacinto Mts., Riverside Co., H. M. Hall. (Plate 11.)

5. Phlox adsurgens Torr.

Slender perennial, with suffrutescent base lying more or less on the ground, with several ascending branches which are mainly herbaceous, glabrous, except the inflorescence which is minutely glandular; leaves opposite, an inch long or less, broad-lanceolate to ovate, not fascicled, shorter than the internodes; flowers

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PHLOX AUSTROMONTANA.

1. PORTION OF PLANT. 2. FLOWER. 3. COROLLA OPENED.

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scattered or corymbose; calyx three and one-half to four lines long, slender, mostly hyaline, this portion slightly replicate, lobes linear and very slender, becoming recurved; corolla tube nearly twice the calyx, very slightly pubescent, lobes obovate three and one-half lines long; one or two stamens slightly exceeding the tube; style included, one-half or more than one-half the corolla tube, ovules solitary in each cell.

Deadwood, Trinity Co., W. C. Blasdale. Seiad Valley, Siskiyou Co., Mrs. Stringer. Humboldt Co., H. P. Chandler. Coniferous forest, Mud Spring to Trinity Summit, Humboldt Co., W. L. Jepson. Mariposa Co., W. C. Blasdale.

6. Phlox dolicantha Torr. and Gray.

Perennial, about one span high, puberulent, becoming glabrous at the base; leaves about one inch long, not exceeding four lines in width, lanceolate, not crowded, but surpassing the internodes; flowers scattered, or in groups of three; calyx from one-half to three-fourths inch long, hyaline portion hardly if at all replicate, ribs prolonged into lax, acerose lobes equalling or exceeding the tube; corolla one and one-half to two inches long, limb an inch in breadth, white, lobes obovate and entire; stigma equalling the tube; "seeds one in each cell" (Torrey).

San Bernardino Mts., S. B. Parish, also H. M. Hall.

7. Phlox longifolia Nutt.

Perennial, a span or so high, erect, glabrous or "finely pubescent" (Nelson), considerably branched from the woody base; leaves one to two inches long, one to two lines wide, midrib prominent on the under side, margins slightly thickened, leaves exceeding the internodes, occasionally fascicled in the axils; flowers solitary or in a few-flowered corymb, borne on pedicels one-half to one and one-half inches in length; calyx four lines long, hyaline portion slightly replicate, lobes subulate to acerose, about one-half the tube or a little more, tube slightly constricted at the top; corolla white, tube slightly exceeding the calyx, lobes four to five lines long, tapering at the base, expanded apex enneate, style shorter than the calyx.

Siskiyou Co., C. B. Bradley.

Var. puberula E. Nelson. Densely glandular-pubescent on the pedicels; leaves and flowers smaller than in the species.

Dixey Mts., Lassen Co., M. S. Baker and F. Nutting, California Academy of Sciences.

8. Phlox occidentale Durand.

Perennial, a span or two high, suffrutescent at the base, glandular-pubescent and somewhat viscid above, branches ascending or erect; leaves one and one-half inches long or less, not crowded, but exceeding the internodes, narrow-oblong, tapering at both ends, some alternate above, rarely fascicled in the axils; flowers solitary or in groups of two or three; calyx four lines long, hyaline portion slightly replicate, lobes subulate, half the tube, erect; corolla tube exceeding the calyx, but hardly twice its length, lobes four lines long, obcordate, "white to rose; ovules solitary in each cell" (Nelson).

Near Kenyon, Fresno Co., H. M. Hall and H. P. Chandler. Fresno Co., Alice Eastwood, G. Eisen. Amador Co., Mrs. K. Brandegee. El Dorado Co., G. P. Rixford. Plumas Co., F. McNaught. Siskiyou Co., H. E. Brown, Miss Cummings. This is the California species, resembling closely P. speciosa of the Rocky Mountains and of the State of Washington.

9. Phlox Stansburyi Heller. *P. speciosa var. Stansburyi* Torr. *P. longifolia var. Stansburyi* Gray.

Perennial, about one span high, stems many, leafy, the whole plant canescent, branches glandular above; leaves narrow-lanceolate to linear, margins slightly cartilaginous, midrib prominent; inflorescence of few-flowered, bracted clusters; hyaline spaces of the calyx markedly replicate; corolla tube twice the calyx, lobes three lines long, obovate.

Willow Creek, Panamint Mts., Coville and Funston.

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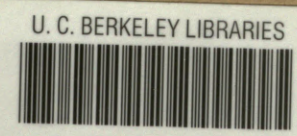

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